

ALBERTA CAPITAL REGION GOVERNANCE REVIEW



# Alberta Capital Region Governance Review

Regional GIS Review – Final Report (Revised)

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#### Confidentiality/Validity

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## 1. EXECUTIVE SUMMARY

The strategy outlined for Alberta's New Economy builds on four targets:

- Alberta as a world leader in innovation, research, development and commercialization;
- Albertans having opportunities to learn, adapt and develop new knowledge and new skills;
- International recognition for Alberta as a competitive force; and
- Albertans enjoying an unmatched quality of life.

GIS is an emerging and innovative tool that can contribute to these targets. As an integrating technology GIS provides a foundation for collaboration, access, and use of information in the Capital Region that can contribute to the environmental, economic, and planning goals of the stakeholders.

Based on lessons learned from numerous Regional GIS initiatives in North America and a survey of the stakeholder municipalities in the Capital Region, this review has identified strong indicators that a Regional GIS:

- Is successful in regional partnerships of municipalities;
- Is beneficial to citizens, businesses and government; and
- Is feasible for the Capital Region.

Based on the interest expressed, opportunities identified, and a high level feasibility, the following recommendation has been developed:

*It is recommended that the Capital Region stakeholders and municipalities support a Regional GIS and proceed with plans for establishing a representative body to oversee the initiative, define the regional framework, and prepare for Definition/Design and Construction/Implementation phases.*

### WHY IS A REGIONAL GIS NECESSARY?

Nearly all information has a location dimension, whether it is a parcel address, a road, a voting district or a city boundary. In providing services to the community and region, stakeholders will have growing needs for such geographic information to efficiently plan and manage land use and infrastructure. GIS are powerful tools to understand and solve complex problems within local municipalities and regional government.

A Geographic Information System (or GIS) uses maps to represent land-based features such as boundaries, land use, roads and water lines. Furthermore, it stores data related to each feature to provide intelligent and powerful analysis capabilities. It will allow an organized view of the region and provide the citizens, businesses, and government the ability to understand the interrelationship between different kinds of data.

Envision the following newspaper headlines describing issues in the Capital Region:

- *"Capital Region Plan Saves Millions on Infrastructure Development"*
- *"Water Quality Clear to Public with Capital Region Website Maps"*
- *"E-Government a Reality in Capital Region Households"*
- *"New Industry Found Its Home Using Capital Region Website"*
- *"Incompatible Development on our Boundaries no Longer an Issue with Regional GIS"*

These outcomes and others could be commonplace with a Regional GIS.

### SUMMARY OF THE GIS REVIEW

This review arose from Recommendation #6 in the First Report completed for the Alberta Capital Region Governance Review (ACRGR), which stated:

"THAT the potential to establish a regional electronic network, incorporating a regional intranet and a geographic information system (G.I.S.), be a priority area for study. ..."

This envisions a regional network, or intranet, where the municipalities share geographic or mapping related information electronically. It would typically use Internet protocols and tools and also provide broader public access through the Internet. Given the feasibility review level of this report, the focus did not dwell on communications technology, but an internet/intranet remains a safe assumption and such a network would inevitably be the conduit supporting a regional GIS.

The review of a Regional GIS for the Capital Region revealed that:

- ☒ A large majority of stakeholders surveyed are in favor of a Regional GIS.
- ☒ There is momentum for GIS development amongst municipalities.
- ☒ A Regional GIS is feasible technically and organizationally.
- ☒ GIS is a key tool in addressing significant regional and municipal issues and opportunities.
- ☒ GIS can be cost-effective despite a significant initial investment.

As part of the review a Regional GIS Framework was developed and includes Guiding Principles, Participation Strategies, Technology Strategies and Management Strategies (Building Blocks). In addition, future strategies are outlined based on a decision to proceed.

### ASSESSMENT

The review identified the existing business, information technology, and geographic information system issues and opportunities among 21 municipalities in the Capital Region. Certain global factors effecting all regions and municipalities are driving the requirement for a regional view and regional GIS. Summarized, they include:

- Global competition (strong regions attract industry);
- Digital economy (effective use of technology and information expands opportunities);

- The Internet (ever-present, standardized communication links, standard interfaces, driving expansion of communication bandwidths required to transmit geographic data);
- Increasing resource pressures (new partnerships and shared services must be sought);
- Public expectation of a one-window or single source approach to information;
- Cross-jurisdictional issues (environment, infrastructure, planning, economy, safety, ...); and
- Increasing implementation of enterprise-wide and system-wide computer applications (to achieve one integrated view).

### **Best Practices and Lessons Learned**

There are many successful cases of multi-jurisdictional GIS implementations in North America and internationally. Internationally, Regional GIS has been developed in Great Britain, the Baltic States and France. The United States appear to have the most wide spread success with GIS at a regional level. From Washington, D.C. to San Diego, California, numerous initiatives have been developed involving federal, state, and local governments. Canada has several examples of regional applications of GIS. Many of the above examples include public sector, private sector and academic contributions.

There is an abundance of "Lessons Learned" including the following:

- A common regional technology infrastructure can drive service improvement and economic opportunities (Joint Venture Silicon Valley);
- Critical infrastructure management, development planning, and impact analysis functions can be directly enhanced by the use of GIS (Region of Peel);
- GIS represents a convergence of state (provincial), local, public, and private interests (Washington, D.C.);
- A regional enterprise wide strategy is needed to ensure a common approach to managing and using spatial information (City of Calgary);
- An organizational structure is needed to cement intergovernmental partnerships in GIS (National Spatial Data Infrastructure);
- GIS requires a defined organization, sufficient funding, and dedicated staffing to succeed (New York State Cooperative); and
- Common standards and methods are necessary for integrating different or incompatible data (Open GIS Consortium, U.S.A.);
- Security, liability, access, stewardship and dissemination of geographic data are key challenges and issues which can be addressed (City of Grande Prairie);
- GIS is a large scale initiative which can be approached in phases ensuring investment is supported by practical benefits (City of Edmonton, SLIM);
- The sharing of spatial data requires leadership, tools, guidelines and common policies (New York State GIS Clearinghouse).

With strong commitment, the Capital Region can leverage these experiences to create a world class Regional GIS that will contribute to the new economy while improving the ability to make decisions by municipalities.

### Key Findings for the Capital Region

Business, information technology, and geographic information system issues and opportunities were gathered through a survey. The analysis of these issues and opportunities revealed the following general findings for the Capital Region:

- ☑ A majority of stakeholders understand the value of GIS and are supportive of embarking on the development of a Regional GIS;
- ☑ There is currently a critical mass of municipalities progressing with GIS initiatives in the region. There is a convergence at the strategic and technical levels. This progress will advance with coordination or without it;
- ☑ There are numerous inter-municipal agreements in place today for service integration that can be better managed and coordinated with a Regional GIS;
- ☑ Momentum is gaining in data integration of departmental systems within municipalities and also the general migration towards GIS technology within the region;
- ☑ Several municipalities have developed their own GIS; and
- ☑ Several municipalities are preparing to invest further in GIS.

### BENEFITS TO STAKEHOLDERS

A Capital Region GIS is a key tool to address the municipal/business issues and opportunities identified in this review. The major benefits identified for the Capital Region include:

- Efficiencies of one-window and single source access;
- Effectiveness of land use and infrastructure management
- Improved coordination in planning for growth and environmental/safety issues;
- Enhanced regional economic development; and
- Consequently, these benefits will lead to improved quality of life for Albertans.

Some of the ways in which unique stakeholders will benefit from Regional GIS are as follows:

- **Citizens** will benefit from complete information provided through the Internet and intelligent maps.
- **Consumers'** expectations of single-source electronically enabled services can be met.
- **Local government administrations** will be able to avoid costs, generate revenues, coordinate services more efficiently with surrounding municipalities, and obtain immediate access to better information (used for example in analysis and decision making for proposals or for testing new ideas such as redistricting or road changes).
- **Rural municipalities** will be better prepared to meet the future demand for core services in their urbanized areas and plan for infrastructure development and improvements for aging infrastructure by sharing information with neighboring urban areas. Environmental impacts of urbanization can also be studied efficiently while achieving results that are more accurate.
- **Towns and villages** that do not use GIS today will be able to engage in the creation of an affordable alternative that will provide the core functionality of a GIS. These municipalities

will also gain access to a large economic development portal in which they can attract new industries, residents and tourism.

- **Government of Alberta** can utilize regional GIS as a corporate enterprise tool for information dissemination and analysis; a one-window opportunity.
- **Albertans as a whole** – Internet-enabled regional GIS has the potential to enhance the Alberta Advantage in the global marketplace by attracting investment.

## FEASIBILITY OF REGIONAL GIS

The following bullets summarize the key feasibility considerations for a Capital Region GIS:

- As infrastructure and other regional planning costs accumulate, municipalities must seek new solutions. These solutions will need to address the various issues and challenges facing information use including freedom of information, privacy, data ownership, changing regulations and investment requirements.
- Municipalities without good information and data may plan, especially on their borders, in ways that impact others in the region. Unnecessary costs and redundancy could result.
- The main cost for GIS resides with the conversion and collection of data. Existing infrastructure and technology can be leveraged toward a regional system.
- The demands by constituencies, changing business practices, and increased environmental and regulatory planning require an integrated approach to information and resource management.
- A wide variety of users including citizens, businesses, the public, economic developers and legislators now have access to GIS due to lower costs, friendlier software and wide accessibility through Internet communications and browsers. Previously, it was a high cost tool available only to highly trained specialists.
- Regional GIS will complement existing and future municipal systems while lowering the cost of acquiring GIS related information. In addition, the success of current and future GIS, for example Social Planning, Disaster Planning or Emergency Response uses, will contribute to the overall success of a Regional GIS.
- Capital Region municipalities have expressed a willingness to share resources, information, and lessons learned in order to contribute toward a more comprehensive Regional system.
- An initial investment of one hundred to three hundred thousand dollars is required to initiate regional GIS plans. Planning projects will be required for system design, construction, and implementation of systems and applications for a Regional GIS can proceed. It is anticipated that individual municipalities will be proceeding with their local GIS design, construction, and implementation during this time frame, however, the regional planning projects will allow for a migration toward common standards and systems.
- Six to nine million is required to support complete implementation over a period of years. Deployment of the base data and initial applications would likely take in the range of 4 to 5 years, but the process can achieve small initial wins that will build momentum. Further development would continue based on a constantly evolving environment with a 5-10 year planning cycle to expand the endeavor to a world-class system.

- Undertaking a regional initiative now will increasingly enable stakeholders to utilize well-organized electronically stored information to meet these demands, to improve management and operational efficiencies and to realize the new revenue potentials and cost savings these systems represent.
- The aspects of commonality in municipal services, willingness to proceed, existing GIS leadership within the region, needs for data, and capacity for technology and system sharing all support the feasibility of a Regional GIS.

Based on the technical and participation requirements for GIS and the willingness of the stakeholders to proceed, the scenario of a Regional GIS being successful in the Capital Region *is desired and achievable*.

### **FRAMEWORK FOR A REGIONAL GIS**

Underlying a Regional GIS is the requirement for a Regional GIS Framework including a common vision and a delivery model consisting of participation, technology, and management strategies.

#### **Vision**

The following components for a common vision are proposed:

- A shared vision and common purpose among stakeholders;
- A world class system based on a fully-integrated regional initiative;
- A common approach to information standards and management processes;
- An Internet-based system accessible by browsers and using Internet protocols;
- A broad range of public information provided over the Internet;
- A regional intranet for stakeholders to share internally focused data;
- Meeting the business needs of municipalities previously unable to afford GIS; and
- Leveraging the existing computing and GIS infrastructure by member municipalities.

A vision must be agreed upon by gaining the consensus of all stakeholders before proceeding.

#### **Guiding Principles**

Based on input from the GIS Subcommittee, interviews and research of best practices, guiding principles were identified as an integral aspect of a delivery framework for a Regional GIS.

The following core guiding principles are proposed for a future system:

- There is an empowered management or leadership body;
- There is a wide understanding of GIS from top-management to technical staff and citizens;
- There is a clear and standard technical infrastructure;
- There is well-trained personnel and GIS-training plans are continually developed;

- There is an organization structure consisting of a GIS Leadership team, a GIS Expertise team, and small temporary project team assigned to specific tasks;
- There is common repository of data, a key prerequisite to regional data sharing;
- There are interagency agreements on technology, data, and application standards;
- There is an initial investment and on-going operation provided; and
- There is a direct link made between costs and the outcomes from the use of GIS.

### Participation Strategies

Several of the existing Capital Region municipalities are now investing in GIS. There is currently little sharing data or planning for integration of GIS between jurisdictions and their systems. The lack of information and data standards increases redundancies and effort while creating barriers for information exchange.

The review identified three participation strategies or options for a Regional GIS. The first suggests the status quo, in other words an unplanned evolution of GIS in the region. The second outlines the progression of GIS through limited partnering and some opportunistic efforts. Finally, the third option describes a proactive approach supported by a central entity and with a shared vision and common purpose among stakeholders. The overview of each option is as follows:

**Strategy 1: No Regional Investment** means no common infrastructure; limited sharing of knowledge and expertise; limited data sharing; and a request basis only for sharing services and data.

**Strategy 2: Joint Cooperative** means formalization of existing and future GIS efforts; sharing of resources and infrastructure; sharing of data; development of various standards and multiple data sources.

This is an incremental approach where some municipalities will gain and others will lag behind. Autonomous municipalities will compete while others may opt out based on their needs and investment capacity. Differences in use of GIS will continue to occur and sharing of data will be commonplace but expensive and limited in its effectiveness. GIS will continue to be used by those who understand its value while others take the time to learn its value.

This second option may yield earlier benefits, however higher long-term costs could be expected. Economies of scale and other possible benefits may not be realized in the long-term.

**Strategy 3: Integrated Regional System** means one standard sharing agreement; established administrative or management structure; sharing of knowledge, single data source, common resources, and flexible infrastructure.

This strategy reflects a strategic vision characterized by dynamic and active progress, collective investments in GIS, and an integrated system at both a regional and municipal level. Elected officials and civic administration will be instrumental in fueling support and leadership for GIS. Consensus building, mutual respect, and sharing data become commonplace and serve to charge the economic and social climate around the Capital Region. The Capital Region soon becomes known as the center of information management. Business, administrators and people become excited with the progressive and sustained growth.

The third option would require a higher initial investment, but lend to later cost avoidance and a broader revenue generation.

In each of the above participation strategies, alternatives for how stakeholders participate may vary. It may be useful for stakeholders to conceptualize their participation in terms of three approaches described below:

- **Voluntary** – In this approach, municipalities willing to assume certain roles in centralizing sets of data do so and then distribute the data to other municipalities who participate and/or pay for such services.
- **Contributory** – In this approach, municipalities agree to contribute or share certain sets of data. Each municipality contributes their relevant data to a common collection source and that information is then made available to all municipalities or other stakeholders including those within the region.
- **Central Entity** - In this approach, a central entity acquires all the relevant data on behalf of the region and ensures the data is standardized and normalized prior to making the data available to all interested stakeholders. Interested parties share in data management and other costs.

#### **Technical Strategies**

The review explored three technical strategies to facilitate the sharing of data in the region. They are:

- Centralized GIS Data Warehouse;
- Distributed GIS Data and Spatial Data Portal; or
- Hybrid Model.

Each strategy will have varying costs, outcomes and implications for a Regional GIS. A critical imperative from the technical perspective is adequate resources to establish data standards, collection of data and maintenance of the data so that high quality spatial data is an integral benefit from the system.

#### **Management Strategies**

A number of elements must be addressed in any systems initiative. Management strategies will be required for system management, applications, resource support, funding, technical infrastructure, and data management. Each building block must be considered, developed and addressed if the Regional GIS initiative is to be a complete success.

## FUTURE STRATEGIES

Based on the support for the recommendation to proceed with a Regional GIS, immediate activities toward a Regional GIS can begin while longer-term plans are discussed and agreed upon.

Immediate strategies suggested for the next 2-6 months include:

- Identify target user communities and users;
- Establish a representative body (central entity) to oversee initiative;
- Define a vision and prepare goals of a Regional GIS;
- Endorse a regional framework and service delivery model;
- Develop a long-term implementation and transition plan;
- Develop a cost (co-investment) and benefit sharing agreement;
- Develop a neutral and region wide format and standards for data exchange; and
- Clean up and consolidate existing data in targeted areas.

Strategies for the next 6-18 months may include the following:

- Identify detailed requirements for each user community;
- Prioritize requirements and develop incremental strategy;
- Identify the specific technology and resources available for a regional effort;
- Construct a regional framework and infrastructure;
- Implement strategic local base maps of data in a pilot initiative; and
- Implement strategic sources of data that exchange different jurisdictional 'languages'.

Long term strategies will focus on the Design and Construction of a Regional GIS.

## CONCLUSION

A multi-partnership or regional initiative toward GIS constitutes a rare opportunity for diverse participants involved in local and regional administration to discuss their activities, problems, and experiences. Such projects provide municipalities with the opportunity for finding new forms of cooperation.

The advantage of such standardization is to enhance collaboration and in the process contribute to the decision-making on local and regional projects.

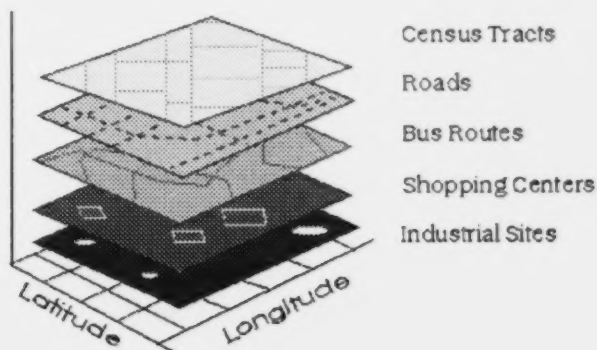
The timing is excellent for a Regional GIS – significant support among the municipalities exists, and a Regional GIS is compatible with the goals of the municipalities in the region and the province of Alberta.

## 2. INTRODUCTION

Nearly all government information has a location dimension, whether it is a parcel address, a road, a voting district or a city boundary. In providing services to the community and region, stakeholders will have growing needs for such geographic information to efficiently plan and manage land use and infrastructure.

Over time, the effects of automation of processes surrounding these information needs will penetrate virtually every local government department and most municipal processes, and will to some degree effect the expectations of citizens, council members and civic and other employees. The use of technology to drive out effectiveness and efficiency in these tasks can be initially expensive, but the alternatives may be more costly.

Geographic Information Systems (GIS) are powerful tools to understand and solve complex problems within local municipalities and regional areas. GIS is a computer system for capturing, storing, checking, integrating, manipulating, analyzing, and displaying data related to positions on the earth's surface. *GIS or spatial analysis and display capabilities (Figure 1<sup>1</sup>) allow an organized view of a region and the ability to understand the interrelationship between different kinds of data.*



### GIS: An Integrating Technology

Figure 1: GIS provides a Visual Dimension

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<sup>1</sup> Source: Kenneth E. Foote and Margaret Lynch, Department of Geography, University of Texas at Austin

Spatial data is not only a catalyst for innovative applications (infrastructure, procurement, permitting, community services etc.), it empower users through a visual dimension of knowledge and decision-making.

Municipalities and regions, which do not utilize GIS systems, may find themselves increasingly unable to meet the demands of information from the constituencies and from changing business practices brought about by new regulations. Moreover, the gaps in a region's ability to meet the demands of global competitiveness and local planning, especially infrastructure and economic development could be detrimental.

The increasing global competitive environment emerging from the Information age and the adoption of Internet technologies has opened the eyes of both private and public sectors to think more strategically and to implement tools and technology that support integrated electronic services.

Government, especially local government should recognize the need for technology-enabled customer centric service delivery. Undertaking a regional initiative now will increasingly enable stakeholders to utilize well-organized electronically stored information to meet these demands, to improve management and operational efficiencies and to realize the new revenue potentials and cost avoidance these systems represent.

Consider the following scenarios:

#### **Economic Development Now and in the Future:**

*While at a conference, an economic developer from the Alberta Capital Region is approached by a company wanting to locate its plant in Western Canada. They would like a list of all the parcels that meet their specifications for the proposed plant. Today, our economic developer would have to request the information from each municipality in the region, a process that may take weeks. Furthermore, many municipalities may not have it at all and would have to assemble the information from various sources.*

*In one future scenario this economic developer could use one query on the Regional GIS Intranet site to list the parcels satisfying the specifications the company provided.*

*In another future scenario, the company itself could perform this query themselves using the browser-based interface of the Capital Region Internet Website. The Website would provide land-based information using maps while also providing additional relevant information about locating in the Capital Region and connecting them to our economic development team.*

*A critical process with huge economic potential that took weeks, or that could not previously be done, has been completed in minutes from a location anywhere in the world.*

### Regional Planning for Future Growth:

*Fred, the urban planner has a very difficult job and that job is getting tougher as urbanization within his city is constrained by a growing number of factors such as environmental sensitivity, increased traffic volumes and drive times and air pollution.*

*Where will services be needed in the future? Is there existing water capacity in the adjacent municipality? What future plans does the adjacent municipality have for land use next to our border? What is the demographic profile of that area today? Will I need to plan for schools and green space or upgrade existing major infrastructure to support future industrial growth?*

*It sounds like weeks of effort to assemble the large amounts of required data into a useable and comparable format. Fortunately for Fred, the required information is already available from a Regional GIS, accessible through the Intranet without the need for specialized software.*

*Now he can go online to view an intelligent map of the entire Capital Region, identify land use zones and query new developments within the neighboring county. He can also call upon a regional planner to discuss long range plans analyzed and created using population growth models. Fred feels more confident in his decisions and design, the result of having the best land information system available at his fingertips.*

Whether it is a tourist saving travel time by looking for a map and directions to a community facility or a municipal planner using the data to inventory streetlights by checking the number and location of each light against construction plans, GIS leads to wider cost savings through collaboration.

### 3. ASSESSMENT FOR GIS

This section covers:

- Drivers of Regional GIS
- Customers and Users of a Regional GIS;
- Common Information Needs; and
- Capital Region Assessment

The following municipalities were included in this review:

|                   |                 |                   |
|-------------------|-----------------|-------------------|
| Beaumont          | Leduc           | Spruce Grove      |
| Bon Accord        | Leduc County    | St. Albert        |
| Calmar            | Legal           | Stony Plain       |
| Devon             | Morinville      | Strathcona County |
| Edmonton          | New Sarepta     | Sturgeon County   |
| Fort Saskatchewan | Parkland County | Thorsby           |
| Gibbons           | Redwater        | Warburg           |

#### 3.1. Drivers of Regional GIS

The following business and technical factors apply to all municipalities and are driving the requirement for an Regional GIS:

**Global Competition** – Municipalities are now competing in a global marketplace to attract and keep industry. The Alberta Capital region finds itself competing against other regions in the country and world rather than the competition between individual municipalities.

**Advances in GIS Software** – Previously, GIS software was expensive and targeted at a few highly trained GIS technicians. Business users are now able to take advantage of easy to use desktop software that is targeted at a wide range of users and business applications.

**The Internet** – The growth of the Internet is enabling and driving a Capital Region Intranet. It provides a de-facto standard communication protocol with a standard user interface through browsers. Further, the Internet is driving increases in capacity of communication bandwidth, which is a key factor in sending the large graphic files required by GIS.

**Advances in Hardware** – The cost/performance improvement of personal computer's has reached a stage where it is enabling widespread desktop GIS usage. Commonly available systems are now able to manage the processing and data required on every desktop for a wide range of land-based business applications.

**Consumer Pressures** – Municipalities are facing increasing expectations from consumers and the public to provide access to information on transparent government processes and to provide E-government services.

**Environmental concerns** – Increasingly stringent environmental and other regulatory constraints require much more advanced analysis and decision support tools such as GIS.

**Increased Fiscal Pressures** – Many responsibilities have been downloaded from federal to provincial to local government. Municipalities can address these pressures by providing streamlined electronically enabled services and by sharing the costs on a regional basis while maintaining their autonomy

**Regionalization** – There is a clear trend across North America towards the formation of Municipal regions for purposes such as attracting industry and managing areas such as regional planning and infrastructure development. By sharing data beyond political boundaries, master planning can incorporate the holistic needs of a region to improve the quality of life for the residents and be sensitive to the environment by minimizing impacts.

**Recognition of Enterprise-wide Approach** - Traditional users of GIS are leveraging their investments through integration of data with other information systems. Integration facilitates the removal of data duplication, streamlines processes and offers more accurate information to all decision-makers. In addition, the cost of managing mission critical data can be reduced. This principle can be applied to GIS at the regional level.

These global pressures are driving regionalization, electronically based land management and regional GIS as a whole.

### 3.2. Customers and Users of a Regional GIS

This review found that many different groups could benefit from functionality provided by an Regional GIS. This was revealed during the current situation interviews, the visioning workshop and the environmental scan. The groups who would use and benefit from a regional GIS include:

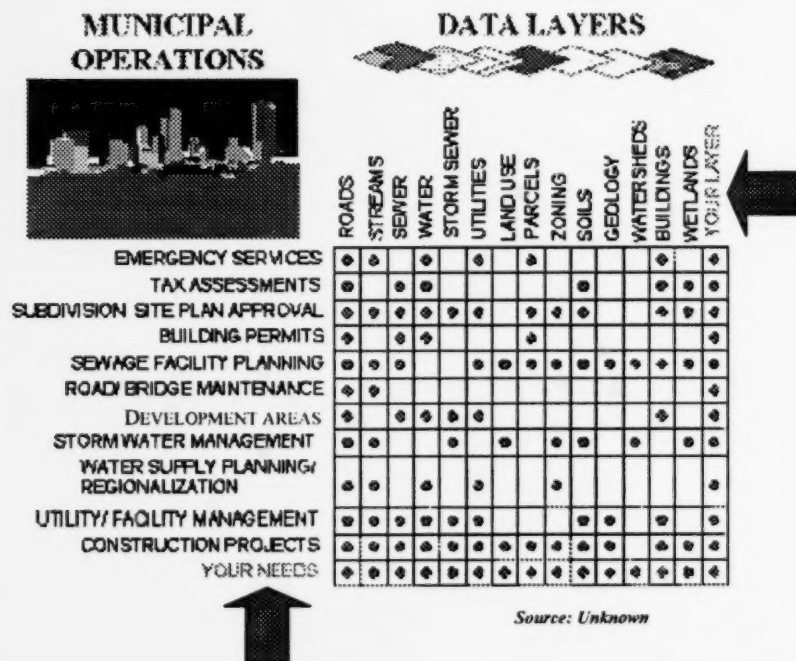
- **The General Public** – could transparently monitor inter-governmental plans and progress in areas such as water quality and transportation disruptions based on appropriate access through easy to use geographical interfaces.
- **Individual Citizens** – could access "their" property information using, secure access provided only to them.
- **Business Community and Industry** – would drive the need for information and establish portals for information exchange.

- **Planners** (including Emergency Services and Utilities)– would have the tools to plan land use in a cooperative fashion with other jurisdictions based on a common body of regional information.
- **Economic Developers** – would, for example, use the ability to query the inventory of available parcels by land use to market the Region as a whole.
- **Engineers** – would have a complete and common body of regional information to plan and engineer regionally, shared services such as water, sanitation and transportation.
- **Municipal Councils** – would have access to easy to use graphical representations of public demand and trends for services and facilities in and around their constituencies.
- **Provincial departments** – would have to complete information for purposes such as regional planning, regional engineering, and regional economic development to “drive home” the Alberta Advantage.

### 3.3. Common Information Needs

Alberta municipalities have common information or data needs related to their municipal operations. The information needs relate to infrastructure, economic development, regional planning, and other activities.

The information can be viewed as layers of data related to the geography or land. The following graphic (Unknown Source) illustrates examples of these common services and information layers. For each service, a given municipality will gather data unique to the municipality and at times common with other municipalities. The opportunity to exchange information across boundaries and jurisdictions requires an understanding of these common data layers.



A Regional or Enterprise-wide approach to GIS can contribute to the gathering, access, and use of such information. A common means of communicating and sharing the data contributes to the effectiveness and efficiency of decisions between jurisdictions. It can also enhance the ability for citizens and businesses to have a seamless view of the region and the relationship of the information to municipalities.

Understanding the information needs and opportunities requires a look at the business, technical and geographic aspects for the region. The following subsection assesses these considerations.

### 3.4. Capital Region Assessment

An assessment of the current business needs pertaining to land and land-related information management, the state of information technology (IT) and GIS was conducted through interviews with municipal representatives and during ACRGR Regional GIS sub-committee workshops. Some information was also gained from public sources. This subsection focuses on the specific findings in the Capital Region.

#### 3.4.1. Key Findings

The following key findings were discovered during the needs assessment phase of this Review. Further information can be found in Appendix D.

- **Wide Range of GIS Usage** – Over two thirds of the municipalities within the Capital Region are using GIS. GIS use varies from simple entry-level tools implemented by some smaller municipalities to several very mature users. A few have been using GIS for years with great success and would be considered leaders in the province and one is well recognized internationally.
- **GIS Momentum is Gaining** – There is gaining momentum in the migration towards GIS as four municipalities are implementing new systems this year alone.
- **Understand the Value of GIS** – A strong majority of the municipalities have a definite appreciation for GIS technology and also believe in the value of developing and using a Regional GIS, albeit their ideas as to what it would look like were widespread.
- **Corporate GIS Integration Valued** – Of those currently using GIS; there was a movement towards data integration with other internal information systems, and also interdepartmental use of the GIS. Sharing of information was recognized as essential in providing better customer service and to achieve a higher level of efficiency from resources that were already being stretched.
- **Numerous Other Agreements** – Numerous agreements exist between municipalities for sharing services. However, limited electronic information is shared on a regular basis that could improve the efficiency and management of shared services, facilities or equipment.

The concepts of partnerships, enhanced service delivery, and improved economies have been well reported and researched through the Alberta Capital region Mini Growth Summit, Metropolitan Edmonton Regional Economic Linkages Report, Synder (1992), and other studies and dialogues. A common observation from these research items suggests that most stakeholders recognize the importance of regional cooperation and the growing interdependence amongst the municipalities.

### 3.4.2. Summary of Business Issues and Opportunities

These findings indicate it is an opportune time to collaborate and develop GIS that will optimize technology investment, leverage knowledge, and enhance information sharing in the most effective manner.

The review identified a number of business issues driving the requirement for a Regional GIS. Categorized by the mandates of the ACRGR they are:

- **Environment/Safety** – Environmental and safety issues involving water, sewer and drainage have come to the forefront recently in Canada. These issues are best addressed on the regional planning level using Regional GIS as an assessment and decision support tool.

More effective and efficient emergency response services can be provided using Regional GIS for service sharing, routing and locating incidents and facilities. Internet-enabled GIS can also make environmental debates more open and transparent to the public.

- **Economic Development** – The Capital Region must compete globally to offer industrial and residential developers a complete list of the development sites that meet their requirements.

Consistency in the definitions of land use classifications within the region is required, so that developers are not unnecessarily challenged to reconcile the different meanings of district labels between municipalities. Regional GIS can provide a vehicle to illustrate this problem and provide a device for consistent nomenclature.

- **Planning** – There is a need for consistent coordinated infrastructure and land-use planning for the region and by municipalities. A Regional GIS would more effectively illustrate these opportunities and encourage the development of mutual processes to resolve issues.

Often, local infrastructure construction continues based on internal priorities, not necessarily based on accurate regional demand forecasts.

The current situation analysis also identified a number of local and regional business needs driving the development of GIS. The following table (Table 1) summarizes the business needs and perceived constraints identified by interviewees’:

| Needs                                                | Constraints                                                                                                                                                                      | Role of GIS/Intranet                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Local Needs</b>                                   |                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                             |
| Increased commitment to customer service             | <ul style="list-style-type: none"> <li>• Lack of resources (time, money, facilities)</li> <li>• More responsibility handed to municipalities from the Province</li> </ul>        | <ul style="list-style-type: none"> <li>• Understanding customers needs by location through demographic analysis.</li> <li>• Automation of public notification.</li> <li>• Provisioning of Virtual City/Town Hall for one stop, 24-hour access to services and information.</li> </ul>                                                                                                       |
| Maintain high quality of lifestyle                   | <ul style="list-style-type: none"> <li>• Growing population with diverse needs</li> <li>• Expected to do more with existing tax dollars</li> <li>• Traffic congestion</li> </ul> | <ul style="list-style-type: none"> <li>• Improve land use and district planning beyond existing borders.</li> <li>• Emergency services -crime analysis and regional dispatch of emergency vehicles.</li> <li>• Environmental management.</li> <li>• Availability and ease of access to more information for citizens.</li> </ul>                                                            |
| Development and management of infrastructure         | <ul style="list-style-type: none"> <li>• Aging infrastructure</li> </ul>                                                                                                         | <ul style="list-style-type: none"> <li>• Plan efficient maintenance schedules of assets inventory and infrastructure.</li> <li>• Provide better records management capability to replace inherent knowledge of undocumented infrastructure information.</li> </ul>                                                                                                                          |
| <b>Regional Needs</b>                                |                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                             |
| Shared services                                      | <ul style="list-style-type: none"> <li>• How do you determine the most optimized way to share services between municipalities?</li> </ul>                                        | <ul style="list-style-type: none"> <li>• Identify where there is demand for services in relation to existing facilities and infrastructure.</li> <li>• Accurately assess usage by area for cost distribution and inter-municipal cost overruns.</li> <li>• Plan future locations of facilities based upon demographics, population growth models or distance proximity analysis.</li> </ul> |
| Attraction of new industry and commercial businesses | <ul style="list-style-type: none"> <li>• Require supporting data stored in silos</li> <li>• Difficult to access the few GIS resources</li> </ul>                                 | <ul style="list-style-type: none"> <li>• Identification of available land matching required specifications i.e. where to find a 10 acre parcel with M1 zoning that has access to sufficient water and sewer and also provides adequate transportation access</li> </ul>                                                                                                                     |
| Reduce inefficiencies and duplication                | <ul style="list-style-type: none"> <li>• Lack of technical expertise</li> <li>• Lack of common standards</li> <li>• Internal processes not aligned</li> </ul>                    | <ul style="list-style-type: none"> <li>• Centralize or amalgamate common land management functions. Integrate GIS with other departmental information systems to remove data duplication and the duplication of effort to collect the data.</li> </ul>                                                                                                                                      |
| Annexation for area expansion                        | <ul style="list-style-type: none"> <li>• No existing policies</li> </ul>                                                                                                         | <ul style="list-style-type: none"> <li>• Explore urban planning options for mutual benefit.</li> </ul>                                                                                                                                                                                                                                                                                      |
| Master planning                                      | <ul style="list-style-type: none"> <li>• Environmental lobby</li> <li>• Insufficient information gathered</li> <li>• No current role or responsibility</li> </ul>                | <ul style="list-style-type: none"> <li>• Decision support system for land use planning, transportation upgrades, environmental impact assessments</li> <li>• Communication tool for proposed development</li> </ul>                                                                                                                                                                         |

Table 1: Key Business Issues

### 3.4.3. Summary of Information Technology Issues and Opportunities

Information technology encompasses desktop computers and servers, networking, operating systems and software applications used by municipalities.

To achieve long range regional prosperity, an electronic information network accessible to citizens, business, and government is required to simplify and reduce development and review approval processes. This information network will also support coordinated regional analysis and planning for economic development and environmental needs (e.g. disaster response).

The information network or Regional Intranet could link data maintained or contributed by individual jurisdictions, allowing for region-wide analysis, access and use. Information aggregation will be enabled through the adoption of data content and format standards for parcel, street, and address data that forms the backbone for all geographic and relational linking of business and community data.

An inventory of existing GIS infrastructure was conducted at a high level. The following table (Table 2) summarizes the IT needs assessment:

|                                                  | Key Observations                                                                                                                                                                                                                                                                                                                                                                                                                 | Analysis                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IT/IS Department</b>                          | The presence of a formalized IT/IS group was observed in 7 municipalities while 13 have chosen to outsource the majority of administration and maintenance of their systems. Some internal resources supported on an ad hoc basis with no formal IT training.                                                                                                                                                                    | The size of municipal population and tax base is a factor in how extensive the IT/IS departments is. The understanding of the value and role of IT appears to be a factor in the adoption of computer technology within some municipalities.                                                           |
| <b>Hardware Architecture</b>                     | Comprised predominantly of client/server configurations or networked PC's running Windows NT or W98 /W95.                                                                                                                                                                                                                                                                                                                        | Some municipalities have ability and capacity to host other municipal GIS data and even provide services through shared systems.                                                                                                                                                                       |
| <b>Network</b>                                   | Several municipalities have cooperated in acquiring a high-speed wireless solution connecting their Local Area Networks (LAN). As many as half of the municipalities are limited only to telephone Internet access.                                                                                                                                                                                                              | The continued provisioning of upgraded communication facilities can be expected to expand to remote areas in demand. High-speed access to the Internet will be necessary for effective regional sharing of GIS                                                                                         |
| <b>Internet</b>                                  | Majority of municipalities (17) have an Internet presence via web site containing local information, contacts, community services, promotional & economic development, business directory, etc. Few have advanced development beyond static information to online forms, ordering maps, and registration of services. Significant interest in adopting the virtual city or virtual town hall concept within the next five years. | Municipalities have a high regard for providing excellent customer service to their constituents and realize that they must provide online services to strive towards a 24-hour, one-stop service counter to reflect the e-business experiences in the private sector such as electronic bill payment. |
| <b>Intranet (private network using browsers)</b> | Deployment was not widespread but some areas had strategic plans to develop in the future. Departments tend to share information more on an ad hoc basis through email as opposed to an integrated approach. This can contribute to data duplication and management problems.                                                                                                                                                    | Some respondents did not recognize the value of an Intranet within their offices. Intranets can extend information sharing/data dissemination for a relatively low cost as updates can be administered in centralized locations and displayed through web browsers.                                    |

Table 2: Key IT Issues

### 3.4.4. Summary of GIS Issues and Opportunities

The state of GIS usage, existing data and skills as was captured in the interview process. The results are summarized as follows:

#### 3.4.4.1. GIS Usage in the Capital Region

Seven municipalities are currently using and expanding their GIS capabilities utilizing software from among the top GIS software vendors. Four (19%) municipalities are in the process of implementing a new GIS solution or are migrating from a legacy GIS system. Nine (<45%) of the municipalities are not currently using a GIS or have opted to delay plans to implement GIS. Chart 1 illustrates the status of GIS within the Capital region by Municipality.

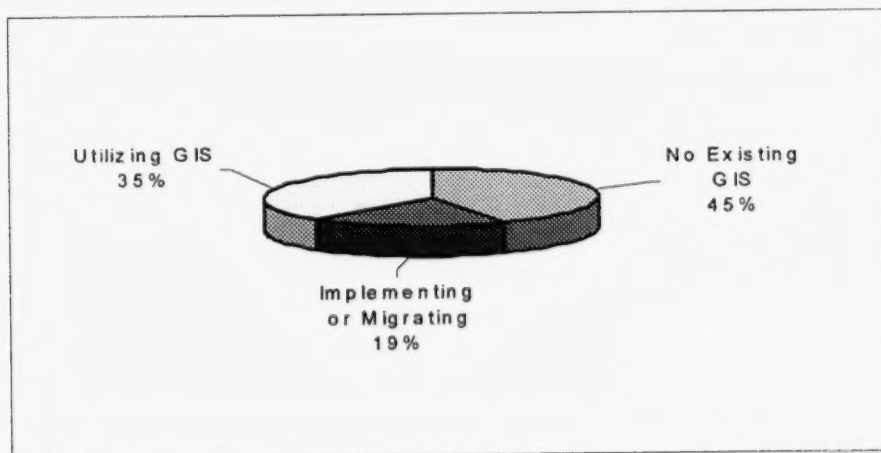


**Chart 1: Status of Municipal GIS Use**

The existing use of GIS can also be considered in terms of geographic location and population base for the stakeholders within the Capital Region as seen in the charts 2 and 3. These views indicate the majority of the region and the population is represented by the municipalities using or acquiring GIS.

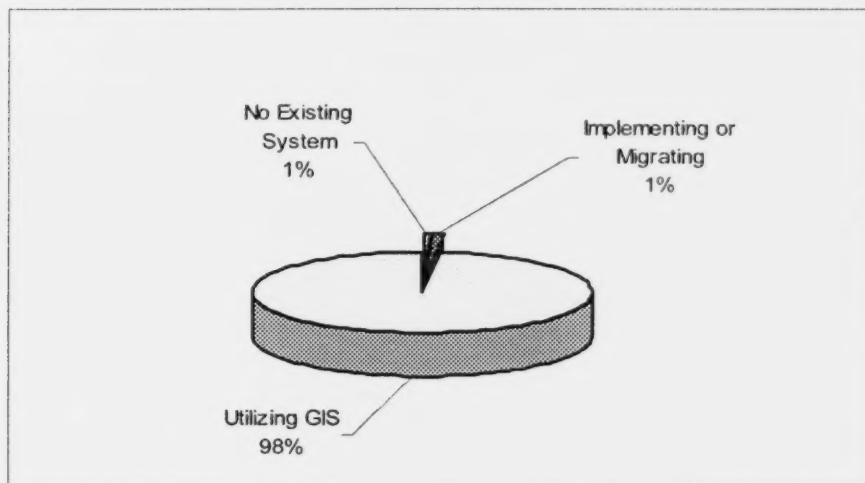


**Chart 2: GIS Status by Geographic Area**

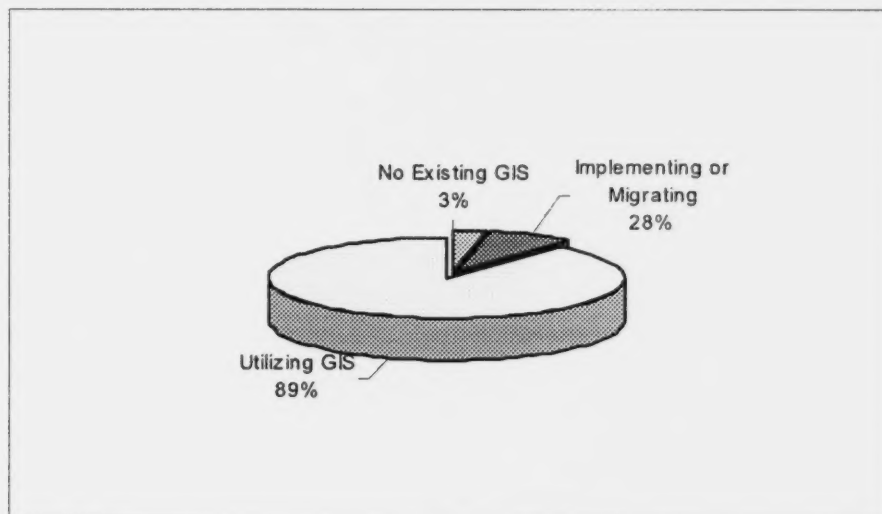


**Chart 3: GIS Use Represented by Total Population**

The graphics are strong indicators that GIS use or planned use within the region has become a significant and common interest.

The next chart (Chart 4) illustrates the GIS application or platform based on those municipalities within the region, which are utilizing GIS or immediately planning for GIS this year:

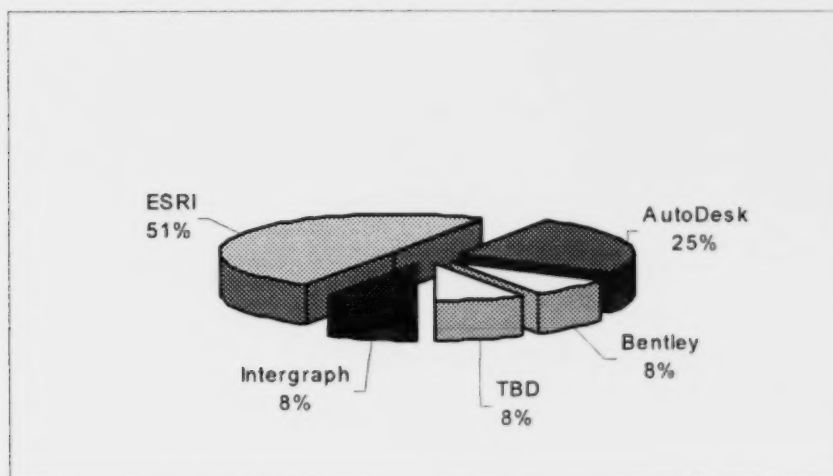


**Chart 4: GIS Vendors by Municipality**

Of those municipalities using GIS, functions and utilization include public works, engineering, planning and development, infrastructure/asset management, permitting, notification, economic development. In cases, GIS data is shared with emergency services, Edmonton Real Estate Board and property assessors.

Very little formal web enabled mapping is deployed within the region although some respondents indicated that it was part of their strategy as other departments such as economic development are requesting access to the GIS data. Numerous GIS software vendors are continually improving their web mapping products, to offer user friendly map navigation/query ability and spatial analysis functionality to the Internet/intranet user.

Other observations revealed no instances of municipalities utilizing new spatially enabled databases however, some municipalities indicated future plans to evaluate these products. This technology is driving towards interoperability of data in a heterogeneous GIS environment. Eleven (53%) municipalities utilize CAD mainly for engineering. CAD drawings were most commonly shared with external agencies or contractors.

#### **3.4.4.2. Geographic Data**

The establishment of a limited common data model that will serve the needs of a regional system is a critical success factor. This data set would consist of an agreed to minimum data set or standard designed to meet the business requirements of municipalities and a regional GIS.

Many of the municipalities currently utilizing GIS have several geographic features captured as part of their system. Common themes include:

| Themes           | Description / examples                                            |
|------------------|-------------------------------------------------------------------|
| Base mapping     | Land parcels (legal polygons, ownership polygons)                 |
| Addressing       | Civic addressing and legal addressing linked to parcel.           |
| Transportation   | Single Line Street network (SLS)                                  |
| Utilities        | Water, fire hydrants, sewer, storm, etc.                          |
| Boundaries       | Political area, land use zoning, enumeration areas, neighborhoods |
| Digital Imagery  | Aerial photo corrected to land references.                        |
| Demographic data | Census data collected by Municipality or Stats Canada (tabular)   |

**Table 3: Geographic Themes in Existing GIS**

Of those municipalities that do not have a GIS, an effort to acquire or create GIS data would be necessary, as a majority of their information is not in an electronic form. Data collection is often the most costly undertaking when embarking on a GIS project however, cost savings could be realized if several municipalities were to cooperate in establishing standards and common processes for this effort.

There exists a wide range of GIS knowledge from novice to expert, which provides an opportunity for cross training, and sharing of best practices. Most municipalities using GIS engage software vendors or contractors to fulfill their customized application development or complex data manipulation needs and tend to focus on spatial analysis and view/query skills. In these cases, a GIS administrator role was often outsourced.

This suggests there is an increasing opportunity for municipalities to work together in sharing best practices, lessons learned, and even resources.

#### **3.4.4.3. Shared or Complementary Goals And Objectives**

Currently, a number of shared service agreements are in place or being contemplated by municipalities in the Capital region. For example, the City of Fort Saskatchewan, the City of Leduc and the Town of Beaumont are exploring sharing GIS services and expertise. There are two aspects to the relationship being explored – Leduc would act as an application service provider to Beaumont and Leduc and Fort Saskatchewan would share experience and the benefits of shared applications.

These agreements form a networking relationship and partnership amongst the municipalities that can be complemented with a Regional GIS. These partnerships and alliances need to be encouraged on both an area and regional basis.

Common goals shared by the municipalities in the Capital Region are highlighted in the following bullets:

- Providing a high level of customer service and value for tax dollar.
- Managing growth and development effectively while being sensitive to the environment.
- Reducing operational costs by improving internal processes.

These goals can be supported by a regional GIS based on the following observations:

- Certain larger municipalities are willing to act as service providers to smaller municipalities. They would potentially provide data storage, processing, GIS expertise and systems expertise.
- Some municipalities realize the benefit of a local GIS, but individually cannot justify the startup costs and maintenance of such a system. These municipalities recognize that a significant amount of their asset inventory knowledge is stored in the minds of a few people and is not documented clearly, leaving them at risk. A common GIS system that addresses the majority of the shared requirements could be developed at a lower cost and data collection or conversion efforts can be maximized through a cooperative, standardized effort.

In addition to these observations, there are a number of existing initiatives where municipalities share services that have a land-based component. They include:

- Capital Region Water Commission services (inventory and location of underground facilities);
- Solid waste management (landfill and transfer station locations, optimization of waste collection routes);
- Transportation planning (monitoring of traffic volumes, road maintenance, master planning);
- Emergency response services (location of incidents and respondents for fire and ambulance, law enforcement, routing of emergency vehicles to an address); and
- Building Permitting and Inspection (association of building to land ownership).

These activities indicate that existing partners have common land-based requirements requiring spatial or mapping related information and data. Equally, many municipalities have different requirements and different approaches for land-based data. These differences necessitate a common purpose or vision in order for stakeholders to work toward common goals.

## 4. REGIONAL GIS FRAMEWORK

The success of a regional GIS will be dependent on the following components being addressed:

- Establishment of a steering committee empowered to manage the initiative;
- Achieving a common vision that is supported politically and is economically feasible;
- Identifying clearly the goals for individual municipalities and the region;
- Ensuring a defined set of design principles (information resource management) are established;
- Developing a delivery model for participation and technical efforts; and
- Identifying a comprehensive set of building blocks for managing and building the framework.

These are described in more detail following.

### 4.1. Vision Development

From a brief exercise with the GIS Committee and from the research completed, the following components of a vision have been identified for regional GIS. A regional GIS will ...

- Envision a world class system based on a fully-integrated regional initiative;
- Be supported by An Internet-based system accessible by browsers and using Internet protocols;
- Provide a broad range of public information provided over the Internet;
- Provide a regional Intranet for stakeholders to share internally focused data;
- Meet the business needs of municipalities previously unable to afford GIS; and
- Leverage the existing computing and GIS infrastructure by member municipalities.

A vision must be agreed upon by gaining the consensus of all stakeholders before proceeding. Examples of GIS visions include the following:

- The implementation of processes and systems to facilitate the integration and management of their spatial and attribute data holdings in accordance with sound Information Management Principles. The system will permit easy access and management of this data at the operational level.<sup>2</sup>
- To create and promote an efficient GIS environment that fosters cooperative partnerships among public organizations to make government services more effective. These partnerships will include collecting data, accessing and sharing data, application development and

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<sup>2</sup> INCOSADA – British Columbia

education that promote coordinated regional land-based processes including economic development, land-use planning, and infrastructure management.<sup>3</sup>

## 4.2. Goal Development

The Regional GIS goals identified during this review include:

- Meeting regional business needs that, without a regional GIS, cannot be fulfilled;
- Supporting formal coordination of GIS efforts to optimize municipal and regional effectiveness;
- Providing GIS functionality to meet business needs of municipalities previously unable to afford it. This includes provision of software application functionality, data and expertise;
- Providing GIS functionality to meet citizen and other customer needs; and
- Developing integrated land-based services to market the Capital Region to the world and drive home the Alberta Advantage.

## 4.3. Principles of Design

Based on input from the GIS Subcommittee, interviews and research of best practices, guiding principles were identified as an integral aspect of a delivery framework for a Regional GIS.

The following core guiding principles are proposed for a future system:

- There is an empowered management or leadership body;
- There is a wide understanding of GIS; top-management and technical staff.
- There is a clear and standard technical infrastructure.
- There are well-trained personnel and GIS-training plans are continually developed.
- There is an organization structure consisting of a GIS Leadership team, a GIS Expertise team, and small temporary project team assigned to specific tasks.
- There is a metadata repository, a key prerequisite to regional data sharing.
- There are numerous agreements on standards.
- There is an acceptable budget available.
- There is a direct link made between costs and the projects that benefit the use of GIS.

In addition, other principles are proposed in support of the core considerations, including:

- Sharing the cost of data acquisition can significantly lower the “cost of entry” or access/use barrier;
- A great deal can be accomplished in a short time by pursuing a strategy of incremental gains, practical goals with challenging deadlines and wide consultation within the community;

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<sup>3</sup> New York State Coordination Program

- Integration of diverse systems should be a focus, as it will result in greater benefits;
- Process improvement must be a focus, as a major portion of the time savings related to automation depend on it (15% to 70%);
- Partnerships with private utility companies, etc. are feasible and cost-beneficial; and
- Technology will evolve. Use it as an enabler when it is available.

#### 4.4. Delivery Model

A delivery model must help establish a long-range plan for the region, assist in dissemination of information, provide mechanisms for data to move from one area to another, and provide value to the constituencies. . The following key strategic areas are suggested and discussed:

- Participation;
- Technical; and
- Management.

##### 4.4.1. Participation Strategies

The review identified three participation strategies or options for a Regional GIS in the Capital Region.

The first suggests that no specific investment is made in a Regional GIS, in other words no change from the current environment. The second is a joint cooperative or limited partnership. The third is an integrated regional effort where a common and comprehensive vision is established.

Several of the existing Capital Region municipalities are now investing in GIS. There is currently little sharing data or planning for integration of GIS between jurisdictions and their systems. The lack of information and data standards increases redundancies and effort while creating barriers for information exchange.

**Strategy 1: No Regional Investment** means no common infrastructure; limited sharing of knowledge and expertise; limited data sharing; and a request basis only for sharing services and data.

**Strategy 2: Joint Cooperative** means formalization of existing and future effort; sharing of resources and infrastructure; sharing of data; development of various standards and multiple data sources.

This is an incremental approach where some municipalities will gain and others will lag behind. Autonomous municipalities will compete while others may opt out based on their needs and investment capacity. Differences in use of GIS will continue to occur and sharing of data will be commonplace but expensive and limited in its effectiveness. GIS will continue to be used by those who understand its value while others take the time to learn its value.

This second option may yield earlier results, however higher long-term costs could be expected. Economies of scale and other possible benefits may not be realized.

**Strategy 3: Integrated Regional System** means one standard sharing agreement; established administrative or management structure; sharing of knowledge, single data source, common resources, and flexible infrastructure.

This strategy reflects a strategic vision characterized by dynamic and active progress, collective investments in GIS, and an integrated system at both a regional and municipal level. Elected officials and civic administration will be instrumental in fueling support and leadership for GIS. Consensus building, mutual respect, and sharing data become commonplace and serve to charge the economic and social climate around the Capital Region. The Capital Region soon becomes known as the center of information management. Business, administrators and people become excited with the progressive and sustained growth.

The third option would require a higher initial investment, but lend to later cost avoidance and a broader revenue generation.

The strategies reflect levels of commitment toward a regional effort versus levels of integration and sharing of data and knowledge by municipalities. The following figure contemplates participation in a Regional GIS as evolutionary and incremental. That is some municipalities will immediately begin to work toward common GIS needs, while others may prefer to delay their involvement in a Regional GIS and/or proceed with their own independent efforts (ad hoc) for now.

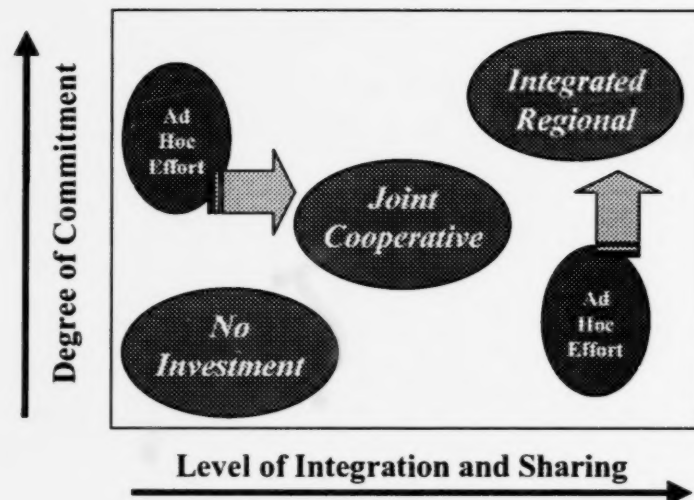


Figure 3: Participation Levels

In each of the above participation strategies, alternatives for how stakeholders participate may vary. It may be useful for stakeholders to conceptualize their participation in terms of three approaches described below:

- **Voluntary** – In this approach, municipalities willing to assume certain roles in centralizing sets of data do so and then distribute the data to other municipalities who participate and/or pay for such services.
- **Contributory** – In this approach, municipalities agree to contribute or share certain sets of data. Each municipality contributes their relevant data to a common collection source and that information is then made available to all municipalities or other stakeholders including those within the region.
- **Central Entity** - In this approach, a central entity acquires all the relevant data on behalf of the region and ensures the data is standardized and normalized prior to making the data available to all interested stakeholders. Interested parties share in data management and other costs.

This model is characterized by regional data sharing, a concept that embraces the strategy of exchanging or providing access to information among and between different municipalities throughout the Capital Region. Regional data sharing can improve information accessibility and consistency supporting local and regional planning and management activities. Instead of each municipality working independently, the regional data sharing approach is based on cooperation of municipalities working together to share commonly needed information.

#### 4.4.2. Technical Models

A number of high level technical approaches can be designed to deliver spatial data from a variety of GIS installations. The right technical strategy chosen will need to meet the minimum requirements and maintain flexibility for future technologies. Ideally, the technical model should be easily modified as the region grows or as the GIS/Intranet industry advances. It cannot be stressed enough that adequate resources be focussed on establishing standards and investing in the collection and maintenance of high quality spatial data within the region. Data structure will always be the fundamental building block of a GIS, as technology will continue to change.

The following alternative technical models were explored for the Capital Region. Using these conceptual models for discussion, it is then possible to address specific architecture and implementation issues in precise terms.

1. Centralized GIS Data Warehouse;
2. Distributed GIS Data and Spatial Data Portal; and
3. Hybrid.

In this model, a common data structure is agreed to and populated into a single GIS vendor format or spatial database. Some municipalities will be able to directly load into this Common Data Warehouse while others will have their data converted prior to loading.

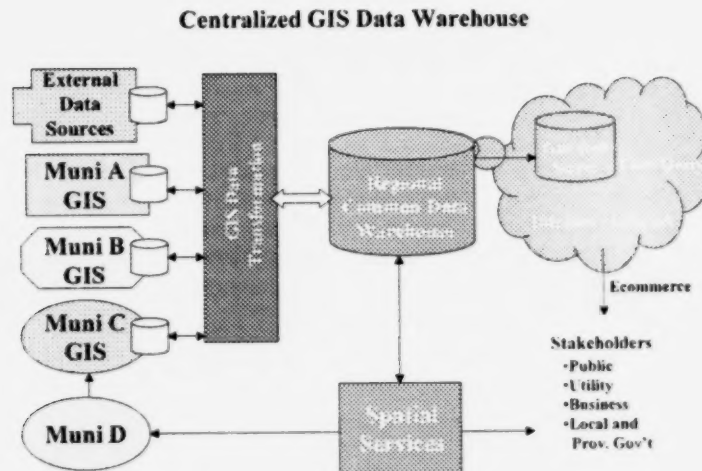


**Figure 4: Centralized Model**

Each stakeholder can obtain regional data located on the Data Warehouse, can access simple to moderate mapping functionality on the web server or can obtain complex spatial analysis through Spatial Services.

For those municipalities without a GIS, Spatial Services could be constructed to perform standard geomatics services such as land base updates and asset inventory.

Other stakeholders can view, query and perform simple analysis on selected mapping layers served up through a GIS Web server across the Internet or intranet. Regional master planning and regional economic development is carried out with intensive analysis through Spatial Services.

Spatial data located on a distributed private network of municipal sites within the Capital Region is connected through a common spatial data portal. Each municipality retains data stewardship responsibilities to assure that information is comprehensive and trusted at their site. A spatial data portal provides centralized access to information relevant to a specific business function as it fuses multiple sources in different formats into one. The spatial context enables an ad-hoc exploration of a range of information derived from a set of municipal business functions within region.

This model provides users with more up to date information, as there is no requirement for the data to be converted and copied to the portal. This will facilitate more accurate and valuable Spatial Services to all stakeholders.

#### Distributed GIS Data and Spatial Data Portal

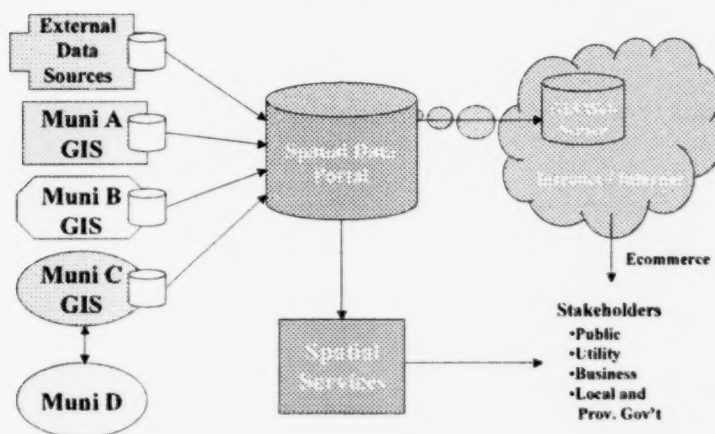


Figure 5: Distributed Model

“Open GIS Specifications will enable interoperation across the web among different vendors’ geo-processing systems to dynamically integrate information from multiple online sources into one map image or a series of maps that visually communicate information. Additional phases will concentrate on fusion and maintenance of the underlying data layers, distributed decision support, analytical services and tailored data visualizations.”<sup>4</sup>

<sup>4</sup> GEOWorld magazine, July 2000

In a hybrid model, municipalities may band together in a small grouping based upon similar systems or geographical proximity to form their own data portals for information sharing. These portals can then be connected to download to a Data Warehouse for regional use. This approach distributes responsibility and resource requirements to a few municipal leaders and would work effectively with a joint GIS participatory model or as a transition towards a fully integrated system.

Spatial services quality will depend on the individual Data Warehouses (Muni G and H) to keep GIS data up to date from the other municipalities. This increase in inter-dependencies may have negative effects on the data and service quality.

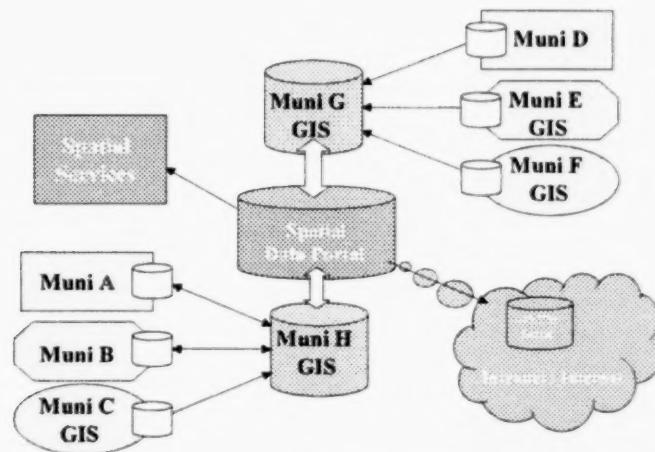


Figure 7: Hybrid Model

#### 4.4.3. Management Strategies

A number of elements must be addressed in any systems initiative. In the context of a Regional GIS, we describe the management strategies or “building blocks” which are essential for developing a sustainable GIS and will play an integral part in optimizing a regional effort. The building blocks are illustrated below and detailed in a subsequent description.

The building blocks must be considered, prioritized and addressed if the Regional GIS initiative is to be a complete success. Each building block is addressed at a particular organization level. As indicated in the blocks below they are:

- Administrative;
- Technical; and
- Governing / elected official.

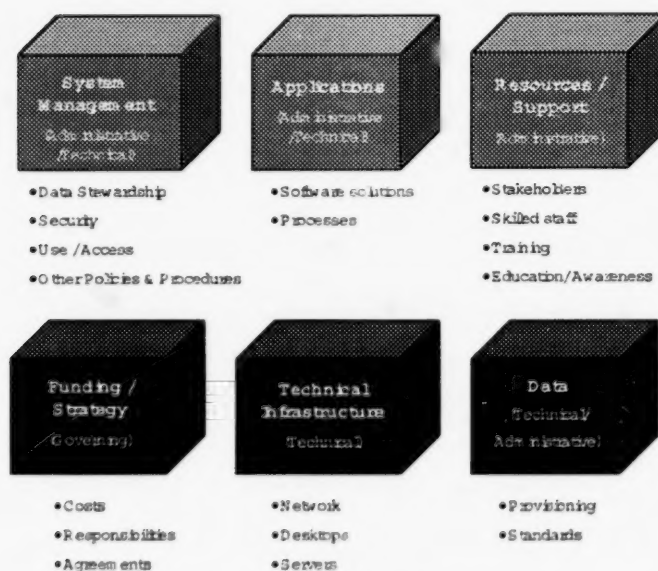


Figure 8: GIS Management Building Blocks

## **Applications**

Applications are discussed first because a business-based approach to system deployment begins by identifying and prioritizing business requirements. The business requirements are met (or supported) by applications. This review has identified a number of business requirements in the section above.

Future steps to address this building block are:

- Further analysis to describe a complete list of business requirements;
- Prioritization of business requirements and associated applications; and
- Definition and approval of project plans providing budgets and timelines to provision the applications. (Note that GIS development is unique in that a significant effort-provisioning base maps data must be completed before applications can be developed.)

Administrative and technical staff should address the Applications building block.

## **Funding/Strategy**

Early in the process funding and strategic issues must be addressed in the following areas:

- Agreements between municipalities must be put in place;
- Funding must be committed to address major costs; and
- Responsibilities at the provincial, regional and municipal levels must be defined.

These issues are addressed at the governing/elected official level.

## **Technical Infrastructure**

Technical Infrastructure is a foundation building block that must be in place before other elements such as applications and data can be provisioned. Technical Infrastructure includes:

- Networks;
- Desktop computers;
- Server computers; and
- Printers and plotters.

Beyond the issue of budgeting for new hardware, few potential issues exist in the technical infrastructure area. One area that may or may not be an issue is the ability to lease telecommunications services that provide sufficient bandwidth. In the short-term sufficient bandwidth is not available to every municipal centre in the Region, but this condition will likely improve in the next 1 to 2 years.

The existing network bandwidth that service providers offers centre's in the Region is somewhat lacking and needs to be upgraded in order to enable Regional GIS. Potential strategies or tactics that have proven effective in motivating service providers in previous situations include the following:

- Government bodies (local, regional and provincial) must actively lobby service providers in order to make their needs known.
  - Part of the lobbying message to service providers may identify their competition in terms of other new or old service providers or in terms of new technology, such as wireless.
  - Another aspect of lobbying may be the Region's requirement to standardize service levels across the region.
  - Also, the digital bandwidth requirement may be included in new service bundles that providers are planning to offer.
- Showcase the region such that service providers could use it in marketing their new products. New levels of technology in the GIS area may be part of this showcase.
- Identify, through a survey, an economic projection or other means, that the demand for higher bandwidth services is or will be much greater in the community than previously anticipated. This may apply to residential usage where the results of a survey may be useful or this may apply commercial usage where an economic forecast.

## Data

Data is a foundation building block that must be in place before other elements such as applications and data can be provisioned. Data conversion and maintenance costs comprise the largest portion of GIS costs. Data issues include:

- Data provisioning – providing data at startup and updating data during production;
- Data standards – including the following areas:
  - Vendor data formats that the regional GIS can use must be understood and agreed upon. Based on the technology used in the regional GIS, a number of formats may be acceptable.
  - Accuracy standards including:
    - Positional accuracy – For example, sub-decimeter means the graphical representation in relation to its coordinates is less than 10 cm from its true earth position
    - Scale – referring to distance on the screen compared to distance on the ground. i.e. A small-scale map like 1:1,000,000 will show a generalized river compared to a large scale like 1:5000 representation, which would contain many vertices (points) to depict more detail.
    - Completeness – what is captured and recorded in the GIS reflects the actual inventory and the content is correct to the best knowledge.
  - Data Constructs and formats – referring to how the data is organized as described by record layouts and how it is formatted as described by field formats, lengths, etc.

- Semantics – the language used to describe the data. For example, is the same districting and land use codes used across all jurisdictions? Do similar names have different meanings?

Approaches to address data issues are as follows:

- Carefully analyze data requirements focusing on application-specific requirements (at least initially) to develop a minimum data set, a subset of total data that could be collected.
- Metadata standards must be developed, based on analysis of the metadata and the underlying data. This planning step precedes data acquisition. Different sub-committees may develop metadata standards for:
  - Semantics (addressed by administrative personnel);
  - Data constructs and formats (addressed by IT and GIS technical personnel); and
  - Accuracy standards (addressed by GIS technical personnel).
- Data provisioning at startup should plan to use existing datasets as much as possible. Careful planning and analysis in this area will pay off.
- Data provisioning during operations is central to the conceptual model used:
  - Data may be provided from the member databases. The regional GIS make take a copy of the data or link to the live database located at the municipality.
  - The regional GIS for its own use may collect data. This then may be distributed to the members or it may not.

### **System Management**

System Management includes the development, implementation and administration of policies regarding:

- Data stewardship - addresses the roles and responsibilities required in the management and operation of a successful database, be it spatial or otherwise. They would formulate and implement policies addressing issues such as:
  - New uses of the data;
  - New kinds of data;
  - Policies and procedures for security and appropriate use;
  - Timely and effective operations involving updating.
- Security – including secure storage, backup and recovery;
- System use and access – including implementation of various classes of users for each application or data set; and
- Other policies and procedures – involving system operations and procedures outside the system.

System management is addressed at the administrative and technical levels. The largest issue for system management may be devoting insufficient attention to it. These issues will always be addressed to a minimum level in an ad hoc fashion, but if not addressed in an informed and complete fashion they create the potential for damaging crises. Avoidable hacker invasions are an example of the result of poorly addressed access and security.

System management issues are addressed organizationally by defining roles and responsibilities throughout the organization from the policy-making level to the operational level. For example, at the policy level, system management for the regional GIS may be envisioned as a regional council representing the municipalities. At the operational level, system management involves adding responsibilities to the roles of those who use the systems and data. This suggests that existing staff may have regional responsibilities threaded throughout their roles.

### **Resources and Support**

Obtaining resources and support for an initiative describes the critical “mind share” aspect of the initiative. It includes:

- Education and Awareness – From recognition of the issues initially to the development of broad awareness in the community, education and awareness is critical.
- Stakeholders – The identification and inclusion of all stakeholders has been identified as a critical success factor (New York State GIS Cooperative Project). Gathering a group of motivated/proactive key stakeholders is the key force in moving the initiative forward. Also, considering the benefits to all stakeholders can assist in the justification of the initiative.
- Skilled staff – Some staff are required to initiate the project.
- Training – is the vehicle to provide skills to users of the system who update, analyze or view the data.

The central issue for the success of the initiative is motivating and building consensus among the key stakeholders. Building awareness through a report such as this plays a part in that effort. Once sufficient mind share is gained, obtaining resources and support is largely addressed at the administrative level.

## 5. FEASIBILITY FOR GIS

This review was able to obtain initial indications of the feasibility for a regional GIS in the Capital region. A more exact feasibility can be established for specific project initiatives as they are defined. A regional GIS should focus on small initial wins for the stakeholders. Further development would continue based on a constantly evolving environment with a 5-10 year planning cycle to expand the endeavor to a world-class system.

The feasibility is based on the following considerations:

- Industry trends;
- The pros and cons of each participation models;
- The pros and cons of each technical model;
- Data issues;
- Other successful initiatives; and
- The impact of other related initiatives in the Capital Region.

### 5.1. Are Regional Initiatives Working?

A number of progressive initiatives have taken place across North America and there is ample experience upon which to build. The Capital Region can leverage these experiences and become a leader in regional local government GIS initiatives in Canada.

Cross-jurisdictional initiatives in GIS have been successfully demonstrated in countless examples in the United States including New York, Indianapolis, Scotsdale, Knoxville, San Diego and Washington. The evolution of similar regional initiatives in Canada has been sporadic and only recent.

As seen in other United States jurisdictions, such as Indianapolis, Indiana, San Diego California, and Knoxville, Tennessee, savings can amount to hundreds of millions of dollars leveraged from a relatively small investment of approximately \$9 million. GIS consortia offer even greater economies when planning for a geographic region.

Silicon Valley, New York State, Cincinnati Area - CAGIS, Minneapolis-St. Paul – MetroGIS, King County, Thurston County Geodata Center are among the most renowned for their efforts and success in implementing a Regional GIS. A detailed description of some of these regional initiatives can be found in Appendix C.

A key to unifying efforts as demonstrated in many examples including the New York Coordination Program was the creation of a coordinating body based on State-level leadership with a new purpose and no previous history. The lesson learned is Provincial government leadership must go hand in hand with local government investment and participation.

The North Central Texas GIS Coordinating Council encompasses a 16-county area that includes the Dallas-Fort Worth Metroplex, one of the busiest commercial areas in the nation. In

Minnesota, "MetroGIS" is a Geographic Information System Project that is helping local governments and other organizations share data in the seven-county surrounding Minneapolis and St. Paul. Its mission is to help regional partners more effectively carry out their business operations and manage costs through sharing data and collaboratively addressing other GIS-related needs they have in common

Cumberland, Ontario is an example of a small Canadian city with a large vision and small pocketbooks. They were able to create their own GIS by joining forces with 11 neighboring municipalities and the Ottawa-Carleton Regional Government to create a virtual enterprise. This venture is streamlining municipal services across the region while minimizing participants' costs and risks. "As a small municipality, we're gotten online capabilities we never could afford independently," said Ned Lathrop, Cumberland's Chief Administrative Officer.<sup>5</sup>

## 5.2. What have been the Benefits?

Specific examples of benefits include:

- Increased productivity in map updating and information handling.
- Map accuracy which equates to safety and productivity;
- One source data updates which mean fewer errors and less redundancy of effort;
- Improved archiving and retrieval of information which improves utility responsiveness to the customer;
- Accurate and timely information which is the basis for improving operations;
- System modeling which is the basis for improved system reliability; and
- Municipal-wide accessibility to information.

## 5.3. What are the Current Trends?

Each of the following trends illustrate the growing opportunities for GIS in the Capital Region and partnerships that may be forged through GIS.

### 5.3.1. General

The GIS industry is undergoing significant changes that are enabling the technology to be used by more businesses and markets in a wider environment. At the same time, traditional users of GIS are leveraging their investments through integration of data with other information systems. Integration facilitates the removal of data duplication, streamlines processes and offers accurate information to all decision-makers.<sup>6</sup>

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<sup>5</sup> Geoworld, August 2000, p. 33

<sup>6</sup> GIS Markets and Opportunities Prospectus, Daratech Inc., 2000

**Lower Costs** - The prices have dropped for powerful hardware and user friendly software customizable with industry standard development tools, which has attracted more companies to the technology. Increasingly, many local governments are taking advantage of this trend by implementing their own GIS and reaping the benefits of improved land management.

**Web Enabled** - GIS usage is also gaining widespread popularity following the proliferation of the Internet and web authoring tools. Interactive maps on the web are closing the gap on desktop GIS software by providing more functionality through a browser. This extends the access and dissemination of GIS data to new users inside and outside of the organization for a very low cost.

### 5.3.2. Standards

#### Provincially

With the formation of Spatial Data Warehouse (SDW) in 1996, the Government of Alberta discontinued its traditional role of managing the high quality cadastral digital map base and entrusted the responsibility to a private organization, AltaLIS. The goal is to make Alberta digital mapping more available, accessible, accurate and affordable through improved processes and standards.<sup>7</sup>

#### National and International

With the abundance of geographic data collected and maintained in different data formats, the user and vendor community as a whole identified the need for an open standard to be able to integrate the data rather than continuing to perform inefficient data conversion. The OpenGIS (OGIS) consortium<sup>8</sup> was established to provide a comprehensive suite of open interface specifications for GIS interoperability. This effort is driving software vendors to adopt data format standards and data transfer standards that will facilitate sharing of GIS data amongst different GIS software products used in the industry, eventually breaking down silos of information.

Database vendors have reacted to the need for improved sharing of GIS data and have created spatial extensions to their products, enabling GIS software from different vendors to read and modify the same data source without translation. This has been an important step forward towards removing proprietary borders.

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<sup>7</sup> Further information can be found at [www.Altalis.com](http://www.Altalis.com)

<sup>8</sup> Further information on the OGIS consortium can be found at [www.opengis.org](http://www.opengis.org)

## 5.4. Why is Participation Necessary?

Three participation strategies have been developed to address the common barriers to information sharing and coordination in GIS partnerships. The barriers are common to the GIS environment; however, they reflect the Capital Region situation:

- Lack of awareness of existing data sets
- Lack of or inadequate metadata
- Lack of uniform policies on access, cost recovery, revenue generation, and pricing
- Lack of uniform policies regarding data ownership, maintenance, and liability
- Lack of incentives for sharing
- Absence of tools and guidelines for sharing
- Absence of regional level leadership

The three participation models proposed have advantages and disadvantages to them as described below: (comment: the following section may have better readability in a table format?)

### **Option 1 – No Regional Investment (No Strategy)**

Pro – No additional investment required other than by individual municipalities, who continue independently with GIS development.

Con – Limited sharing of information, no standards, and delays in requesting ad hoc data.

### **Option 2 – Joint GIS Efforts (Simple Strategy)**

Pro – Sharing of knowledge and best practices, cost savings through efficiencies gained, allows for flexibility in partnerships.

Con – Municipalities left out are disadvantaged, standards being formed in isolated groups may be dissimilar throughout the Capital Region, and values may be compromised.

### **Option 3 – Integrated Regional System (Complex Strategy)**

Pro – Full participation among all stakeholders will ensure region succeeds as a whole, achievement in regional standardization, cost savings through improved coordination and integration of services managed by GIS/Intranet, improved master planning.

Con – May be unable to achieve consensus, likely some disparity between the leaders and laggards, personal agendas and egos may interfere with progress.

## 5.5. How could Spatial Information be Delivered?

The technical strategies put forward were designed to generate discussion and dialogue around a theory of tying together a variety of dissimilar GIS formats into a single 'window' that would support the needs of the region. The three technical strategies proposed earlier have advantages and disadvantages to them as described below:

### **Centralized model**

- Pro – System development for applications accessing a common format is relatively easy.
- Con – Spatial data that is copied to a warehouse needs to be refreshed frequently in order to maintain currency. If allowed to get stale, data will eventually not be trusted or used.

### **Distributed model**

- Pro – Spatial data accessed in real time through logical connections offers the most up to date and trusted data. The map portal provides a standardized view and consistent style when moving through the various information layers.
- Con – Maintaining 'live' connections to all municipalities in a reliable fashion may not always be achievable with existing network. Complex application development may also be required.

### **Hybrid model**

- Pro – Leverages off of existing relationships between municipalities, can be flexible in migration towards a fully distributed model
- Con – May not achieve the maximum potential efficiencies.

All of the above models could work however the distributed model appears be gaining widespread acceptance as technology advances are overcoming the current obstacles of connectivity and integration.

## 5.6. What are the Resource Requirements?

Developing a GIS involves investment in five areas: computer hardware, computer software, geographic data, procedures and trained staff. The acquisition of the computer hardware and software are often incorrectly viewed as the most expensive activity in a GIS program.

Budgets for GIS in the millions of dollars are in place in the Capital region at this time. To coordinate these efforts to for example, so that a standard data model is developed, would not be cost-prohibitive. The Regional GIS would require initial investment funding for setup and could be designed to be self-supporting based on external revenues through web-based access or fees from spatial services.

There is strong and persuasive research that suggests GIS provides tangible and intangible benefits to a single municipality. The targets established for the City of Grande Prairie, Alberta identified a 5% improvement in efficiency. Actual findings from the City of Indianapolis,

Indiana use of GIS identified an annual reduction in operating expenses by \$26 million and long term savings reaching \$250 million, realized through an initial investment of \$9.2 million in GIS. Additionally, the City of Scottsdale, Arizona enjoys annual benefits from GIS valued at \$2.5 million from an initial investment of \$3 million. Each of the regional initiatives discussed in Appendix C present similar findings.

However, the question of whether these benefits can be leveraged through regional initiatives has only recently been researched. The New York State GIS Cooperative Project demonstrated the overlap between data needs, resourcing efforts, development strategies, and costs for a GIS. The findings from this initiative reveal that sharing or regional strategies can reduce the cost and increase the value of GIS at every level of government.

### **Economically**

Research, has demonstrated that developing the geographic database (which includes some of the procedure and staff costs) can account for 60% to 80% of the GIS development costs. Continuing costs for operation and maintenance are also dominated by the data costs. Coordination of GIS programs, particularly among several local government agencies, can minimize the cost of database construction and maintenance, and can provide for the greatest use of the database, which gives maximum benefits from the investment.

Other GIS consortiums, such as Washington, D.C., have estimated required funding levels ranging from 2 million to 6 million (US dollars) and anticipated their requirements to be in line with these estimates. Based on similarities observed it is anticipated that a Capital Region GIS project would require funding in the six to nine million dollar range to support complete implementation over a period of years. Deployment of the base data and initial applications would likely take in the range of 4 to 5 years, but the process can achieve small initial wins that will build momentum. Further development would continue based on a constantly evolving environment with a 5-10 year planning cycle to expand the endeavor to a world-class system.

Other Regional GIS systems have been provided startup capital by higher levels of government and have goals of becoming self-sustaining within a few years.

The development of an economic strategy in the recommended planning stage (what is the recommended planning stage?) will identify the size of investment in spatial data and supporting components over time.

### **Technically**

Technically, regional GIS is more feasible than it ever has been. The computing power required for is available and very affordable compared to previous times. The Internet has provided ubiquitous connections using standard protocols with the bonus of a standard (browser) interface.

Some potential issues still exist in the Capital region regarding dedicated high-speed connections however, the analysis revealed this situation will likely be addressed in the timeframes that will meet the timelines for a Regional GIS initiative.

Existing IT infrastructures throughout the region varied substantially in size and performance. Depending on the participation and technical strategies chosen there are options for upgrading system components that would facilitate a progressive evolution toward a world class Regional GIS. At the present time dial-up Internet connections in the municipal offices are currently capable of accessing a Regional GIS Intranet, however, a dedicated high-speed connection would be preferred for future web-enabled mapping and online access to spatial data.

A technical strategy will focus on what outputs are expected from the system and what inputs and processes are required to achieve them. The expected inputs will comprise data (the majority of the system costs), personnel, and training. The technical strategy will require a realistic description of data and system requirements and the ability to benchmark requirements and the ability of applications to meet those needs. A direct relationship needs to be examined and identified to ensure the inputs (investment) are matched with the outputs and outcomes including quality, value, and satisfaction.

### **Data**

Common data standards do not exist for all municipalities in the region and they must be developed. Recent industry progress from consortiums such as *NSDI (National Spatial Data Infrastructure)* has produced data standards that have been adopted by many data custodians. Furthermore, every municipality is in the same business of local government and differing data models can be standardized to support common objectives.

Data, including base map data, is not in place for every municipality in the region, however base map data is available from several suppliers including AltaLIS and GIS value added companies that are also capable of capturing GPS data representing underground facilities and assets.

Developing and implementing a data standard for the region *will* require significant effort and there will be issues stemming from accuracy requirements (rural vs. urban) and what attribution to capture. The benefits intrinsic to completing this task are significant and include having a common language dictionary, data dictionary (feature definitions, custodian and stewardship roles, quality assurance specifications, access security) and metadata standards. Technical solution possibilities should not preclude the true business requirements that can be proven to be cost effective or efficient when conducted through a Regional GIS. Plans to integrate data from other inter-municipal departments would also need to be included in the technical strategy.

Based on the Sierra Systems knowledge-base and a review of 12 other regional GIS initiatives the following benefits of regional GIS, categorized by effectiveness and efficiency, can be anticipated:

## Effectiveness

While qualitative, the benefits can be substantial. The GIS may be used to accomplish several tasks that were not previously done due to their size and complexity (e.g., flow analysis in water and sewer systems, traffic analysis, etc.).

As these are essentially new tasks, a comparison between manual and GIS methods is not possible in this review. While not measurable, the benefits from these applications can be substantial. Generally categorized as better planning, better or more effective decision-making, these applications support more effective investment of government resources in physical infrastructure where relatively small performance improvements can translate into large dollar savings. GIS also provides an effective way to communicate the problem and solution to the general public and other interested parties, categorized as:

- Public Communications – Internet-provided GIS provides an effective way to communicate problems and solutions to the public.
- Customer Service – Improved information, more avenues of service provision providing quicker flexible service can be enabled via Internet-enabled regional GIS.
- Safety – Municipalities are facing potential safety issues in the areas of drinking water safety, fire safety, ambulance service, etc. Regional GIS, is the key tool to ensure these issues are addressed from the planning stage, rather than through more costly retrofits.
- Infrastructure Planning - Relatively small performance improvements in effective investment of government resources in physical infrastructure can translate into large dollar savings.
- Land Use Planning.
- Economic Development.

## Efficiency

Existing manual tasks done more efficiently by the GIS result in substantial savings of staff time. In the local government context, the largest savings come from answering citizen inquiries of many types. Depending on the size of the municipality, savings using the query function of a GIS can range from 2 person-years for a smaller town, to 5-8 person years for a large town, to 10 or more person-years for a large county. Measuring the time to respond to a query manually and by GIS and multiplying the difference can derive estimates of potential timesaving by the number of expected queries. This information is usually gathered during the Needs Assessment.

Existing manual tasks done more efficiently by the GIS result in substantial savings of staff time:

- Citizen Inquiries – One initiative demonstrated that the largest savings came from answering citizen inquiries of many types. Depending on the size of the municipality, savings using the query function of a GIS can range from 2 person-years for a smaller town, to 5-8 person years for a large town, to 10 or more person-years for a large county.
- Mapping processes – Increased productivity in map updating and information handling.

### Caveat

There are many benefits to implementing a GIS. However, it is understood that none of these benefits are real unless the products provided by the GIS in mapping and modeling the system result in a change in the operation of the municipality. Benefits of a GIS are derived for the most part from productivity savings. What this means is that if the map products delivered from the GIS are mirror duplications of the manually drawn product the project team has not tapped the potential for flexibility, accuracy, standardization, and clarity which a GIS offers. Assuming a GIS team has accomplished their task of applying the GIS to all of its potential, benefits can be derived.

## 5.7. What other Initiatives effect a Capital Region GIS?

A number of other initiatives are underway in the Province and Region involving Internet deployment of municipal services and intra-municipal land management systems. Organizations involved include AUMA, Alberta Municipal Affairs and the City of Edmonton as an example. Municipalities surveyed were not aware of or did not comment on these initiatives.

Initiative such as Municipal Infrastructure Management Systems, Alberta One-Window, and Edmonton Economic Development efforts bring many of the themes of collaborative sharing and partnering into a regional or enterprise-wide perspective.

However, no existing infrastructure or regional initiative shows the potential to be *the* coordinating effort that will lead the Capital Region municipalities in working together to address regional GIS opportunities and challenges. The experiences and expertise of external stakeholders to this review could well serve to enhance a regional initiative in the Capital Region. The City of Edmonton GIS and SLIM (Spatial Land Information Management) initiatives provide an example of integrating diverse departmental and business systems; in many ways a parallel to the opportunities and issues experienced at a regional level.

## 6. STRATEGIES FOR PROCEEDING

A central strategy for proceeding will be a continuing need for ensuring a broad participatory process is used to achieve full consensus on matters critical to the success of a Regional GIS.

### *What kind of system is needed?*

Ideally, a data centric system with a flexible, scalable architecture for future growth and integration of new technologies (software, wireless, GPS) is recommended. A system built with the understanding and consideration of “Lessons Learned” of other Regional GIS systems and how they can be applied to the Capital Region.

An scenario might involve the creation of a ‘Regional Consortium, staffed with competent GIS and IT resources (provided on temporarily assignment from contributing municipalities). This group would form the core team to work with value-added partners to setup the Regional GIS and fulfil the data stewardship role. The consortium would be considered a ‘Center of Excellence’ for GIS and would promote best of breed municipal applications and practices.

### *What would it deliver?*

It would integrate various spatial data into a seamless map of the Capital Region, loaded with accurate and up to date data set (layers of information) of the minimum dataset and allow for additional layers of supplemental data. It would support existing and future shared services, facilitate data sharing in an effortless and cost-effective fashion.

Access would be furnished through a secure intranet (a virtual private network available only to municipalities or close stakeholders) and through the internet for global access to public domain information. Complex spatial analysis and modeling (trends or growth) would be performed within the consortium to serve regional and local planning efforts as well as external requests on a fee basis. Municipalities not currently using GIS could use the services to meet their local core needs such as land and asset management.

A Regional GIS would be sensitive to the uniqueness of each individual municipality such as rural vs. urban needs. It would also respect current GIS investments while moving towards common goals.

### *How could it be organized?*

A well-defined organizational structure is essential for successful implementation and ongoing operation. The following structure is proposed:

- Board of Directors with Chairman – leadership, policy and priority setting, approval of annual budget, promotion, and external communications.

- General Manager - project coordination, manage staff, regional business and partnership development, prepare annual budget.

- Core Staff – hands on technical and geomatics resources for design and implementation of technology and spatial data management.

Representation from each participating municipality should be balanced and equal to ensure all needs and requirements can be voiced and discussed.

Other broad recommendations for the activities of an Integrated Regional System include:

- Developing and promoting standards and infrastructure that support GIS reliability, quality, and performance for the region
- Promoting wider adoption of GIS within the region and individual municipalities
- Providing other GIS services to the region that reduce cost and add value
- Supporting specific GIS application deployment for planning, economic development, and health and safety related activities.

It is intended that the concept of a Regional GIS be based on a constantly evolving environment with a 5-10 year planning cycle. In other words planning and implementation of a Regional GIS will be iterative and build on small wins while expanding to a world-class system.

## 6.1. Potential Goals and Objectives

The following goals represent the collective input of contributors and lessons learned from other start-up regional GIS organizations.

- Create a self sustaining GIS organization
- Establish standards for all Spatial & Attribute Data managed by the Regional GIS.
- Ensure the quality and currency of data products by establishing metadata standards
- Process all Spatial & Attribute Data managed to meet the established data standards and establish a seamless (physical preferred, but logical acceptable) spatial database for the region.
- Create comprehensive, land-based data for the Capital Region
- Eliminate (or control) data redundancy.
- To improve the efficiency of managing Spatial and Attribute databases within the region by eliminating duplication of effort, and improving business workflow and processes.
- Design and develop a system for managing this data. This system should support integrated business processes for Edit, Update, Distribution and Reporting.
- Improve access to Information.
- Demonstrate a commitment to excellence by educating partners, stakeholders, and the community about the benefits of spatial data and a regional depository

## 6.2. Potential Benefits for Capital Region Stakeholders

- Standards will be defined for spatial and attribute data.
- Spatial and associated attribute data will be linked
- The Structural quality of the data will be improved (easier to manage).
- Access to information will be improved.
- It will be easier to share data across program areas and with external agencies.
- Metadata will be collected and linked to data.

- Common data management tools that are easy to use and scalable to meet future business requirements will be developed.
- Spatial and associated attribute data will be managed simultaneously.
- Standard tools and processes will be developed.

### 6.3. Recommendations

The GIS Subcommittee has obtained solid indications that Regional GIS:

- Is desired and will be beneficial;
- Is feasible.

Three tracks for action are suggested:

- Clear identification of the constituency to be served by the Regional GIS
- Articulation of a clear understanding of the shared information by participating agencies
- Design and development of a functional prototype of infrastructure and enabling technologies

These actions need endorsement of strategy, scope, time and which municipalities are interested in proceeding.

Based on the interest expressed, opportunities identified, and a high level feasibility, the following recommendation has been developed:

***It is recommended that the Capital Region stakeholders and municipalities support a Regional GIS and proceed with plans for establishing a representative body to oversee the initiative, define the regional framework, and prepare for Definition/Design and Construction/Implementation phases.***

The consensus of the GIS Subcommittee and the findings from the 21 municipalities support the recommendation of the project review team. There is considerable momentum, interest and enthusiasm, which can be captured.

## 6.4. Implementation Plan

Here is an overview to help guide actions once a decision to proceed has been made!

Immediate activities focused on a Regional GIS can begin while longer-term plans are discussed and agreed upon. Strategies suggested for the next 2-6 months include:

- Identify target user communities and users;
- Establish a representative body (central entity) to oversee initiative;
- Define a vision and prepare goals of a Regional GIS;
- Endorse a regional framework and service delivery model;
- Develop a long-term implementation and transition plan;
- Develop a cost (co-investment) and benefit sharing agreement;
- Develop a neutral and region wide format and standards for data exchange; and
- Clean up and consolidate existing data in targeted areas.

Strategies for the next 6-18 months may include the following:

- Identify detailed requirements for each user community;
- Prioritize requirements and develop incremental strategy;
- Identify the specific technology and resources available for a regional effort;
- Construct a regional framework and infrastructure;
- Implement strategic local base maps of data in a pilot initiative; and
- Implement strategic sources of data that exchange different jurisdictional “languages”.

A series of ‘quick wins’ will build confidence and support funding requests. It is recommended that proof of concepts be produced for education and generation of ideas, moving towards a pilot project within the region. Strong Project Management and stakeholder commitment is vital to get off the ground successfully.

### Discussion

A Regional GIS requires solidifying the common vision and setting priorities.

- The foundation for input has been obtained. Getting on with the Regional GIS can now be the focus.
- Based on that, a strategy must be developed to address organizational, human, technical aspects with a number of projects defined to address each.
  - Development of economic, policy, and technical strategies
- A requirements definition exercise must be done to obtain a complete set of prioritized requirements for the region. The efforts to address each requirement should be divided into budgeted projects addressing applications, data, technology, processes and human skills.
  - Detailed Requirements Analysis and Technical, GIS, and Data Assessment

- Each of the defined projects must be performed and their resulting systems implemented including:
  - Development of a Long-term Implementation and Transition Plan
  - Development of a regional and community-wide communications strategy
  - Design and Agreement on a Delivery Model (including consensus on a vision and goals)

Following these planning projects, specific design, construction, and implementation of systems and applications for a Regional GIS can proceed. It is anticipated that individual municipalities will be proceeding with their local GIS design, construction, and implementation during this time frame, however, the above planning projects will allow for a migration toward common standards and systems.

- Eventual Deployment including projects to:
  - Design processes to support each application requirement (to deliver the application and ensure data kept up-to-date)
  - Provision the data required to meet each application requirement
  - Potentially, provision GIS software for municipalities who do not have it
  - Provision server and desktop hardware for municipalities where there is a requirement
  - Provision network communications to the required bandwidth
  - Perform activities to manage the human side of change to ensure people meet the challenge of new competencies and processes with enthusiasm.

Experts estimate that up to 80 percent of the cost of GIS is tied to the collection and creation of spatial data. Often, however, data created by one organization can be used by other organizations with similar needs, so sharing can yield considerable efficiencies. This premise is the basis for suggesting that a Regional GIS is feasible for individual municipalities, and moreover for the Capital Region as a whole.

While many stakeholders in the Capital Region have a diverse array of spatial expertise, data, and infrastructure, they lack a common focus that can leverage those separate resources to achieve broader but similar objectives.

## 7. CONCLUSION

A multi-partnership or regional initiative toward GIS constitutes a rare opportunity for diverse participants involved in local and regional administration to discuss their activities, problems, and experiences. Such projects provide small municipalities with the opportunity for finding new forms of cooperation. It becomes necessary for those involved to negotiate, discuss and take into consideration their partners activities as well as their own.

In some cases, GIS implementation within a framework of a multi-partner project, particularly when these partners are small municipalities, may promote further collaboration. This has been demonstrated in the experiences from the United States and Canada contained in Appendix C.

The aim of a Regional GIS may be viewed as helping small and medium sized municipalities gain the technological tools they need. Moreover, these municipalities and larger ones or those with GIS capability can develop a pool of common knowledge, which in turn can represent a common planning tool. All partners can then base their decisions and actions on the same information and the same geographical references.

The advantage of such standardization is to help towards collaborative decision-making and may in the process improve the appropriateness of other regional projects.

The timing is excellent for a Regional GIS – significant support among the municipalities exists, and a Regional GIS is compatible with the goals of the municipalities in the region and the province of Alberta.

## APPENDIX A – PROJECT BACKGROUND AND APPROACH

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### Background

The Alberta Capital Region Governance Review (ACRGR) has pledged to initiate dialogue and action toward strengthening the ability of the Capital Region to compete in the global marketplace. It has the objectives to:

- Develop leadership principles to establish and address regional priorities and to describe an effective way to coordinate leadership of the region;
- Describe how Capital region municipalities and the Province can work together to address regional opportunities and challenges; and
- Develop service delivery goals on the path to determining how municipal services can best be delivered within the region.

The GIS review arose from Recommendation #6 in the First Report completed for the ACRGR. That recommendation stated:

*<sup>1</sup> “THAT the potential to establish a regional electronic network, incorporating a regional intranet and a geographic information system (G.I.S.), be a priority area for study.*

*This region should be a leader in implementing electronic networking at the regional level. There is potential to create a regional Intranet in which all municipalities share information electronically, in compatible formats, using shared software and technology. This would strengthen the region, support coordination, and improve efficiency.*

*The advent of geographic information systems has greatly expanded the potential for management of lands and facilities in the region. Regions like those surrounding San Diego, CA., and Vancouver, B.C., have shown that a G.I.S. can improve economic development, environmental management and transportation planning.”*

Sierra Systems was engaged to complete this review further to Terms of Reference prepared by the GIS Subcommittee.

The objective of this project is to determine the feasibility of municipalities in the Capital Region sharing a common base of geographical information. Appropriate information would be obtained from and provided to government organizations, citizens, industry and the public over a network.

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<sup>1</sup> The Alberta Capital Region Governance Review (ACRGR) has the objectives to:

1. Develop leadership principles to establish and address regional priorities and to describe an effective way to coordinate leadership of the region;
2. Describe how Capital region municipalities and the Province can work together to address regional opportunities and challenges;
3. Develop service delivery goals on the path to determining how municipal services can best be delivered within the region.

The review safely assumes the network would utilize Internet/Intranet protocols and tools, as this is the emerging standard.

A complete description of the project is contained in a Project Description prepared by Sierra Systems for the GIS Subcommittee. The review does not include detailed architecture design, package selection or costing estimates for GIS applications or solutions. Moreover, it is only one step toward harnessing consensus and strengthening an understanding between municipalities.

### Review Process

Key activities of the review encompassed:

- Assessing the current situation;
- Developing a framework for a regional GIS;
- Determining the feasibility of a regional system; and
- Preparing options for proceeding.

The steps in the review approach are illustrated in the following diagram.

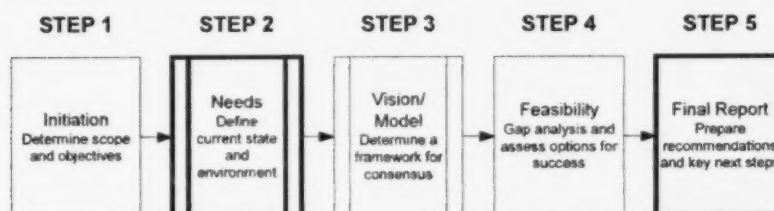


**Figure A: Project Stages**

The needs assessment involved an interview with each municipality covering the municipal (business), information technology, and GIS issues and opportunities. Based on additional requests by the GIS Committee, the project team undertook a review of other regional GIS initiatives and considered not only the opportunities for the region, but also for municipalities.

Based on a visioning workshop with the GIS Subcommittee and based on Sierra System's expertise in GIS, a framework for Regional GIS was developed. This included the aspects of vision, conceptual participation, technical models, and the building blocks of an effective system.

### **Involvement of Stakeholders**

This process relied on the direction, feedback and approvals of the GIS Subcommittee with representation from approximately eight (8) municipalities. The main contribution to this process came from interviews with representatives from twenty-one (21) municipalities. The contributors and participating municipalities are detailed in Appendix B.

These points should be understood regarding the composition of the participation in this process:

- The GIS Subcommittee focused on regional issues while individual members assisted in providing local perspectives.
- The composition of the GIS Subcommittee was extremely diverse. It contained management, staff with IT expertise, staff with GIS expertise and elected officials.
- Project scope and timelines allowed only one interview per municipality. This provided a good range of representative indicators from across the region, but by no means allowed for the development of a complete set of requirements.

## APPENDIX B - STAKEHOLDERS AND CONTRIBUTORS

### Map of Stakeholder Municipalities (Figure B)

***This Region is comprised of 21 municipalities***

5 - cities

1 - specialized municipality

3 - rural counties

9 - towns

3 - villages

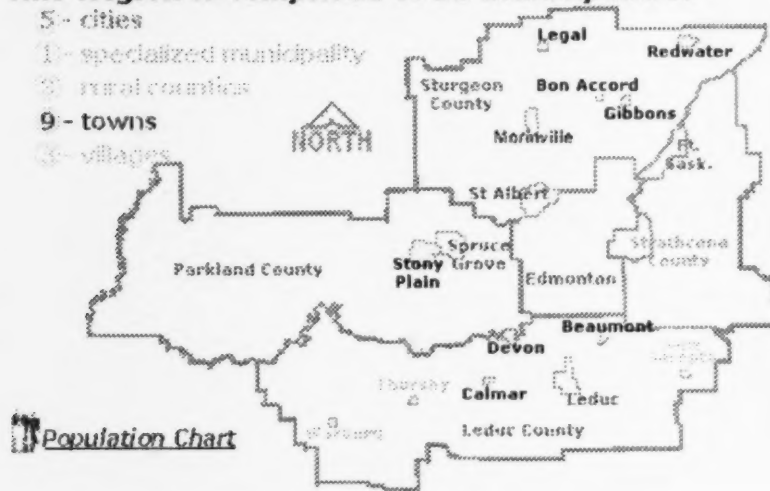


**Figure B: Municipalities Capital Region**

## Demographics of Stakeholder Municipalities (Table A)

|    | Municipality      | Area (Hectares) | Population (1999) |
|----|-------------------|-----------------|-------------------|
| 1  | Beaumont          | 192.00          | 1,797             |
| 2  | Bon Accord        | 679.64          | 2,748             |
| 3  | Calmar            | 4,743.00        | 13,109            |
| 4  | Devon             | 3,600.00        | 49,243            |
| 5  | Edmonton          | 69,984.00       | 616,306           |
| 6  | Fort Saskatchewan | 980.00          | 6,226             |
| 7  | Gibbons           | 575.00          | 6,295             |
| 8  | Leduc             | 204.90          | 1,493             |
| 9  | Leduc County      | 247.45          | 1,095             |
| 10 | Legal             | 235.77          | 359               |
| 11 | Morinville        | 733.54          | 2,053             |
| 12 | New Sarepta       | 2,720.00        | 8,274             |
| 13 | Parkland County   | 217.00          | 725               |
| 14 | Redwater          | 177.83          | 549               |
| 15 | Spruce Grove      | 858.00          | 4,496             |
| 16 | St. Albert        | 3,741.00        | 14,305            |
| 17 | Stony Plain       | 266,249.00      | 12,361            |
| 18 | Strathcona County | 246,462.00      | 24,769            |
| 19 | Sturgeon County   | 2,588.00        | 14,271            |
| 20 | Thorsby           | 126,883.00      | 65,340            |
| 21 | Warburg           | 209,405.00      | 15,945            |
|    | Total             | 941,476.13      | 861,759           |

## List of GIS Subcommittee Members (Table B)

The GIS Subcommittee included representatives from the Alberta Capital Region Governance Review and the following municipalities:

| Organization      | Committee Member              |
|-------------------|-------------------------------|
| ACRGR             | Lou Hyndman                   |
| ACRGR             | Bill McMillan                 |
| Beaumont          | Frank Johnson, Gordon Stewart |
| Devon             | Cors Van Steenis              |
| Leduc             | Don Jorgensen                 |
| Leduc County      | Graeme Langford               |
| Spruce Grove      | Joe Acker                     |
| St. Albert        | Doug Vaculchik, Art Krutz     |
| Strathcona County | Dave Dubauskas, Ivan Bering   |
| Sturgeon County   | Frank Schoenberger            |

## List of Contributors (Table C)

The contributors to the review included the GIS Subcommittee and representatives from the following municipalities who participated in interviews:

|    | Municipality      | Contributor(s)                                            |
|----|-------------------|-----------------------------------------------------------|
| 1  | Beaumont          | Frank Johnson, Rod Fraser                                 |
| 2  | Bon Accord        | Alan Saunders                                             |
| 3  | Calmar            | Darrell Garceau                                           |
| 4  | Devon             | Marilyn McMartin, Randy Dubord                            |
| 5  | Edmonton          | Joni Mines, Stephen Pelech, Gordon Willis, Dave Fairbairn |
| 6  | Fort Saskatchewan | Michelle Bohachyck, Clayton Kittlitz                      |
| 7  | Gibbons           | Marg Clark                                                |
| 8  | Leduc             | Don Jorgensen                                             |
| 9  | Leduc County      | Graeme Langford                                           |
| 10 | Legal             | Wilma Weiss                                               |
| 11 | Morinville        | Bruce Walt                                                |
| 12 | New Sarepta       | Darrek Dobko                                              |
| 13 | Parkland County   | Jim Simpson                                               |
| 14 | Redwater          | Earla Wagar                                               |
| 15 | Spruce Grove      | Joe Acker, Jeff Mustard                                   |
| 16 | St. Albert        | Doug Vaculchik, Art Krutz                                 |
| 17 | Stony Plain       | Adele Ethier                                              |
| 18 | Strathcona County | Dave Dubauskas, Ivan Bering                               |
| 19 | Sturgeon County   | Rick Wojtkiw                                              |
| 20 | Thorsby           | Aleks Nelson                                              |
| 21 | Warburg           | Christine Pankewitz                                       |

## List of Regional GIS Review Project Team (Table D)

Sierra System's Project Team include the following core team members and advisors:

| Role                          | Team Member                 |
|-------------------------------|-----------------------------|
| Project Manager               | Barry Huybens               |
| Senior Business Analyst       | Bernie Dick                 |
| Spatial Business Analyst      | Kevin Van Den Bruel         |
| Partner in Charge and Advisor | Ed Marchak                  |
| Senior GIS Advisors           | Terry Tarle, Darin Williams |

## APPENDIX C – EXAMPLES OF REGIONAL GIS INITIATIVES

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### Silicon Valley

The 'Joint Venture: Silicon Valley Network' completed a feasibility study of regional GIS in August of 1999. It focused on technical issues to the exclusion of the institutional issues such as what data should be shared and with whom. A number of similarities and dissimilarities to the Alberta Capital region highlight the issues here:

- There was a consistently high education level and awareness of technology capabilities, including those of GIS, throughout the region.
- All municipalities had well developed GIS systems in place, therefore:
  - There was not the widely varying level GIS technology and expertise found in the Capital Region.
- All municipalities were urban, therefore:
  - Few issues with differing standards of positional accuracy existed, because it was consistently at the sub-decimeter level.
  - Most jurisdictions could afford to host their own Internet server.
- Similar to the Capital Region, they had an inherent attraction to deployment over the Internet.

The key lessons that can be taken from this review include:

- Data must be interoperable (standardized) in terms of:
  - Standards and definitions – recommended national data standards;
  - Data constructs and formats – recommended well defined purposes for the data; and
  - Semantics – the meaning of the language must be understood clearly by all.
- The most important question facing the development of a regional GIS is the selection of applications. However, a more frequently articulated desire is for access to the data, possibly because the conventional GIS applications such as map display, spatial analysis and modeling are assumed to be features of any GIS.
- They concluded a **common information system for land use and transportation planning** in the Silicon Valley area **is feasible**.
- A regional GIS that is truly interoperable requires a very comprehensive understanding of each contributor's databases and processes and stated that it would not yet be cost-effective, because members were not yet prepared to share in the deployment and fully utilize it.
  - They **recommended a test-bed** as a step toward a regional GIS in **order to capture system requirements and local data cultures**.

## New York State Coordination Program

[www.nysgis.state.ny.us](http://www.nysgis.state.ny.us)

The GIS Coordination Program in New York emerged in 1996 from the convergence of several parallel efforts that had been developing for several years<sup>10</sup>. The first statewide policy on GIS was issued in September 1996 to establish a framework for the development of a statewide GIS Program. It created a GIS Coordinating Body drawn from state and local government and the private sector. It sponsored several initiatives that put the policy into action:

- **A data sharing cooperative** – The State government issued a policy directing all State agencies to join the cooperative by signing a standard agreement. This provided access to GIS data of all members at virtually no cost.  
Local governments, not-for-profit-organizations were successfully invited to join. Agreements with federal agencies have been signed and data sharing agreements with private consultants are under development.
- **Designation of primary data custodians** – This provides clarity of ownership. The agency that originated the data is designated as the sole primary custodian. Users of the data are encouraged to provide corrections.
- **A GIS data set clearinghouse** – A Web-based clearinghouse provides direct access to selected data sets and describes the datasets held by members and how to obtain them.
- **A metadata repository** – Using a prescribed federal metadata standard, data producers describe the data they have available to members.

The key lessons that can be taken from this project include:

- Leadership was provided from the state-level, the agency-level and individual expert level. It is notable that the State-level leadership had no “history” and was perceived to have the commitment of the State’s top elected leader.
- A policy-driven coordination effort *was* able to leverage the vast array of spatial data, pockets of GIS expertise and localized coordination efforts into a whole much more greater than the parts.
- Standard metadata is an essential prerequisite to effective information sharing.
- A great deal was accomplished in a short time by pursuing a strategy of:
  - incremental gains;
  - practical goals with challenging deadlines; and
  - wide consultation within the GIS community.

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<sup>10</sup> New Models for Collaboration: GIS Coordination in New York State,  
<http://www.ctg.albany.edu/resources/rptwplst.html>

The Clearinghouse was established to disseminate information about New York's Statewide GIS Coordination Program and to provide access to the New York State GIS Metadata and Data Repository.

Originally developed as part of the Center for Technology in Government's GIS Cooperative Project, the Clearinghouse was created to provide one central location where State agencies and local governments can list the GIS data sets that they have. GIS users can browse the list, or search by specific keywords, to find out what data is available, who holds it, and how it can be obtained or downloaded.

**1998 URISA Exemplary Systems in Government award winner**

- The clearinghouse model resulted in very low-shared costs. The largest shared cost was two FTEs to operate the clearinghouse. Otherwise, agencies volunteered staff time to meet agreement mandates such as metadata development.
- Based on overlapping usage, sharing the high cost of acquiring data between jurisdictions yields considerable benefits and efficiencies.

## **SANDAG - San Diego Association of Governments**

**[www.sandag.cog.ca.us/index2.html](http://www.sandag.cog.ca.us/index2.html)**

Some 18 cities and a county government form SANDAG serving as the forum for regional GIS decision-making. The Association builds consensus, plans strategically, obtains and allocates resources, and provides information on a broad range of topics pertinent to the region's quality of life.

Mapping applications provisioned over the Internet include Regional Economic Development Information (REDI), Demographic and Economic Mapping, Industrial Cluster Interactive Mapping and an Interactive Atlas. Environmental GIS applications are used for conservation programs and watershed analysis for the region. Operates a nonprofit corporation which offers specialized information services and analyses to private businesses and other agencies. The corporation's services include tailored growth projections, market studies, fiscal and transportation analyses, demographic profiles, and more.

Winner of **Outstanding Internet Web Site Award** from the California Geographic Information Association (CGIA) at the California GIS Conference in March 2000.

## MetroGIS – Minneapolis, St. Paul Metropolitan Area

[www.metrogis.org](http://www.metrogis.org)

MetroGIS is a multi-participant, Geographic Information Systems (GIS) initiative helping local governments and other organizations serving the seven-county Minneapolis-St. Paul Metropolitan Area more effectively carry out their business operations and manage costs through sharing data and collaboratively addressing other common GIS-related needs.

MetroGIS is in effect aimed at institutionalizing data sharing so its stakeholders can easily obtain accurate and reliable data they need from others to carry out their business functions, in the form they need it. A broadly participatory process was used to achieve consensus on a variety of matters critical to the success of MetroGIS.

Representatives to offer suggestions about how the federal government would be a resource to help regional GIS collaboratives overcome challenges and meet local objectives

## TGC - Thurston County GeoData Centre

[www.geodata.org](http://www.geodata.org)

An effort to develop a regional geographic information and mapping system began in 1984 through a joint feasibility study initiated by Thurston County and the cities of Lacey, Olympia and Tumwater. As a result of that study, Thurston Geographic Information Facility (TGIF) was created in 1985/6 through an Interlocal Agreement. The purpose of TGIF is to provide County staff with accurate spatial geographic information and provide access and support in utilizing this information in their daily operations. It also provides support and services to Federal, State, and local agencies, private business and the general public.

Presently, TGC is maintaining over 70 different layers of geographic information about Thurston County, providing service and support to over 100 government and private organizations and the general public, providing training and support to 30 additional users throughout the county, Lacey, and Olympia; and maintaining and developing geodata for the county.

Thurston Geodata webpage

(<http://www.geodata.org/scripts/esrimap.dll?name=TGCMAP&Cmd=Map>) provides an interactive demonstration of attribute data within and between various communities within the Thurston County region.

Winner of URISA (Urban & Regional Information Systems Association) **1999 Outstanding Achievement Award.**

## CAGIS - Cincinnati Area GIS

[www.cagis.hamilton-co.org/CAGIS](http://www.cagis.hamilton-co.org/CAGIS)

The Cincinnati Area GIS (CAGIS) in 1995 was a partnership between the City, a county and two private utility companies. It had the goals of improving the efficiency and effectiveness of the permitting services offered by the private sector, while enabling the real-time maintenance of the geographic and alphanumeric databases.

CAGIS is a consortium comprised of the agencies in the City of Cincinnati and Hamilton County, the Cincinnati Bell Telephone Company and Cincinnati Gas & Electric. The GIS is a "decentralized" system design, all data maintenance activities are performed by the various City/County departments and utilities. The CAGIS Consortium is supported by a small centralized staff of twelve technology experts augmented by students from the University of Cincinnati. The staff administers the shared CAGIS database, develops GIS applications for the consortium, administers the geographic integration framework, manages the CAGIS network, designs and implements the management and data capture methodologies supporting data maintenance, and establishes standards for data sharing.

The key lessons that can be taken from this include:

- Data maintenance activities must be built into the organizations' various work processes;
- A major portion of the time savings related to automation depended on re-engineered workflow (15% to 70%); and
- Partnerships with private utility companies are feasible.

## Washington GIS Consortium

[www.ncpc.gov/planning\\_init/wgis.html](http://www.ncpc.gov/planning_init/wgis.html)

In 1995 the National Capital Planning Commission recognized the opportunity for a Regional GIS and initiated the Washington GIS Consortium to share spatial data, technology and expertise. Since then the Consortium has successfully created and shared spatial data and has attracted more than 20 partners from federal, regional, and local governments and the private sector. The integrated Washington GIS network that is now being established by NCPC and its consortium partners will improve the planning and management of federal facilities and support local economic revitalization.

## Canadian Regional GIS Initiatives

Few examples of regional GIS initiatives parallel to those in the United States can be found in Canada.

### Scarborough, Ontario

A new public access mapping application in Scarborough, Ontario, is cutting both city costs and customer queues while raising the city's pride. Scarborough's new system, called the User-Defined Mapping Application system (UMAP) is an extremely effective use of readily available technology running on an enterprise-wide database.

Although not a comprehensive example of a regional initiative, the Scarborough section of the City of Toronto are award winning in terms of their innovation and leadership in the field of GIS.

UMAP allows city employees to view maps on computer screens or to print areas of the city, located in the eastern Toronto metropolitan area. A map can be produced in any of a number of scales and can include particular features, such as roads, buildings, sidewalks, trees or watercourses as well as other information available from the city's geographic databases including property lines, municipal addresses and the names of public buildings. A hard copy, done while a customer waits at the counter, costs between \$5 and \$20 depending on the size of paper selected.

Scarborough is not selling data, but is simply automating a service traditionally provided at this counter. The system could be expanded, however, to computers in public libraries or at public information kiosks in the future.

Other benefits of UMAP include:

- Elimination of hard-copy maps. Maps previously maintained in various departments of the city for the purpose of whiteprint reproduction were very expensive to produce and cumbersome to extract and replace. These maps have now been replaced by computers at both the public counters and at the desks of employees who create maps.
- Simplicity. Maps can now be easily created of the area desired. It is unnecessary to use either drafting staff or graphic artists for most requirements.
- Clarity. Maps can now be created with only the objects of interest shown, highlighting exactly what is desired, rather than using maps already created for other purposes.
- Efficiency. Staff are freed to do more sophisticated graphic or mapping work requiring their special expertise.

Unintended benefits include:

- Interestingly enough, UMAP was not a major objective of Scarborough's GIS development project. Very few municipalities in North America have set up such an extensive geographic information system. They embarked on a journey into GIS at the beginning of 1990 when the

Municipal Council mandated the development of "the best user-oriented, user-defined municipal geographic information system in North America."

- After years of intensive user involvement and enterprise-wide data modeling exercises, word spread across city government on what could be achieved by GIS in an integrated environment. The requests for special reports, usually in map form, became so numerous and time-consuming that it became almost a matter of self-protection for the GIS staff to get "simple" mapping requests directly into the hands of those making the requests.

### **Region of Peel**

In Canada, the Region of Peel representing three municipalities demonstrates how information technology and GIS can be utilized and leveraged to more effectively manage modern business issues. This initiative does not appear to be a comprehensive or true example of multi-stakeholder involvement in a regional GIS initiative. Their site <http://www.region.peel.on.ca/maps/index.htm> provides an extensive amount of facilities information.

## **Canadian Municipal GIS Initiatives**

### **Town of Markham, Ontario**

The Town of Markham, Ontario is known as the "high-tech capital of Canada" and demonstrates a simple yet practical approach in using GIS for legal, economic development, land development, and land planning purposes. Their interactive site (<http://216.183.6.81/onxpress/>) illustrates how citizens, businesses, and local government can benefit from using spatial data. This example illustrates the integration of several attributes including streets, business areas, council wards etc.

(Instructions: Either go through the tour or click on the "View status map for 1999 road surfacing projects". The first map may not look particularly meaningful but zoom in until you can make out the property lines. Check the "Display Aerial Photos" box and "Display Parcel Text" as well as choose the "Label parcels with" option such as Owners Name. You can obtain a lot of assessor data from any parcel by selecting "describe a parcel" clicking on a parcel on the map. Note the measure capabilities - linear and by area).

A similar example of interactive mapping can be found at a site by First Base Solutions (<http://www.firstbasesolutions.com/welcome.htm>). This example illustrates the integration of local municipal data overlaid on actual aerial photographs in addition to attributes such as schools, ponds, and zoning.

### **Metro Toronto**

Metro Toronto Land Information Services (LIS) provides reference framework for all land related information, which is the vital link between their clients' application projects and their land related information. LIS addresses the need to coordinate a variety of multi-disciplinary activities. LIS employs sophisticated interactive graphics, digital mapping, and database management systems for a wide range of services in information management, information access and topographic and thematic mapping in the Greater Toronto area.

The interactive map site (<http://maps.city.toronto.on.ca/accesstoronto/asp/mapframes.htm>) for the City of Toronto provides a less sophisticated view as compared to the Town of Markham above.

### **Grande Prairie, Alberta**

The City of Grande Prairie, Alberta ([www.city.grande-prairie.ab.ca/gis\\_bens.htm](http://www.city.grande-prairie.ab.ca/gis_bens.htm)) has demonstrated its leadership in the area of GIS planning over several years.

### **Edmonton, Alberta**

The City of Edmonton has an advanced understanding of GIS. The world-wide attention and recognition their leadership in GIS has garnered demonstrates their expertise. The City of Edmonton's work with their SLIM (Spatial Land Information Management) could be instrumental toward a Regional GIS for the Capital Region.

The following has been extracted through their site ([www.gov.edmonton.ab.ca](http://www.gov.edmonton.ab.ca)). (Instructions: Click on "Living in Edmonton", then click "Edmonton Map" (under Getting around Edmonton). Enter the site and you'll notice a few things they have started:

- ability to create a thematic map of households owned by percent
- create demographic reports by population, average income across the entire city or by neighborhood.
- Find churches, schools, hospitals, parks, sports facilities by neighborhood (their map symbology could use some greater color contrast as its hard to make out some of the symbols)
- Find an address, locate to map).

### **History Note of GIS in Canada**

In the June, 1994, issue of GIS WORLD magazine H. Dennison Parker, publisher of GIS WORLD and president of GIS World Inc., made the following statement: "As the birthplace of GIS, Canada spawned many of the ideas and systems that evolved into standard practice in modern GIS and invested in a digital database of that vast country years before the United States even figured out it needed one".

## APPENDIX D – DETAILED FINDINGS

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This Appendix describes the key GIS opportunity areas and then continues with a detailed set of tables documenting the survey findings. The opportunity areas are categorized by the mandates of the three goals of the ACRGR Commission: environment/safety,

1. Environment/Safety,
2. Economic development, and
3. Planning

### **1. Environment/Safety**

Environmental and safety issues involving water, sewer and drainage have come to the forefront recently in Canada. These issues are best addressed on the regional planning level where Regional GIS is a key tool.

More effective and efficient emergency response services can be provided using Regional GIS for service sharing, routing and locating incidents and facilities. Internet-enabled GIS can also make environmental debates more open and transparent to the public.

### **2. Economic Development**

Economic development efforts have proven to be substantially improved through the use of GIS to reveal locations for particular business or industry requirements. The region as a whole should be able to offer commercial, industrial and residential developers a complete list of the sites that meet their requirements in the Region. Geographic features that comprise most developers' requirements include the capacity of the water service, sewer service, power service, road service, and the zoning of the area.

The definition's of land use classifications is not consistent between municipalities in the Capital Region. Industrial (and residential) developers who are looking at the Capital Region for new sites are unnecessarily challenged to reconcile the different meanings of district labels between municipalities. Regional GIS should provide a vehicle to illustrate this problem and provide a device for consistent nomenclature.

### **3. Planning**

#### **Regional Land-Use Planning**

There is a need for consistent coordinated planning for the region. In the absence of a regional influence municipalities are developing based on their internal priorities, without foresight into the effect this will have on the region in the long term.

The lack of inter-municipal processes, such as the process for the annexation of rural land into urban municipalities can lead to unsatisfactory negotiations, delays in needed development and potentially inconsistent land use across municipal boundaries.

A regional GIS would be a tool to more effectively illustrate this problem and encourage the development of mutual processes to resolve these issues.

Declining revenue bases are forcing municipalities to allow development using more relaxed standards than their neighbors are in order to attract new ratepayers. Revenue, particularly for rural municipalities, is shifting and declining due to industrial aging/growth and changes to Provincial regulations.

An example of this is the burgeoning development of residential properties in rural municipalities. The projected impacts of this development both for the near term and the long term needs need to be predicted and analyzed within a regional framework.

Some municipalities feel they are in short supply of industrial, commercial or developed land within their borders. While a regional GIS may not resolve this problem immediately, it can function as a location analysis tool for new businesses or residents and may be able to identify lost opportunities and justify land use changes based on customer inquiries.

### **Regional Engineering Planning**

Local infrastructure construction continues based on internal priorities, not necessarily based on accurate regional demand forecasts. Projects done out of priority sequence or to the wrong capacity may be viewed as errors. GIS has the ability to model flow and capacity for water, sewer, traffic, etc.

An opportunity exists for municipal engineers to share information on innovative techniques used in infrastructure development (such as the use of planning holding tank locations that pump through smaller lines at night). An open regional GIS would provide a vehicle for this type of exchange.

### **Local Land-Use Planning Using Regional Data**

Municipalities have identified the need for regional GIS data to assist in their local land use planning processes. For example, compatible land uses can more easily be planned across boundaries if the municipality has up-to-date information on hand. This should result in more compatible development proposals.

### **Land Management for Small Municipalities**

Even though the cost of GIS software has dropped in recent years, municipalities with lower revenues find it cost prohibitive to establish systems to manage their land base with electronic systems such as GIS. Their operations are missing the benefits of this functionality in the areas of

planning, land management operations, engineering infrastructure maintenance, etc. that electronic tools provide.

### **Basis for Cost-Sharing of Services**

Residents of neighboring municipalities share services such as recreation facilities, transportation networks, and emergency response. While some cost sharing agreements are in place, agreements for more services are required and agreements for existing services require more accurate methods of justifying cost sharing. Analysis of usage based on the geo-location of users in the Capital region would provide a demonstrable basis for justifying cost sharing.

### **Regionalized Services**

Many services such as water, sewer and drainage may be further regionalized in order to gain additional operational efficiencies as the urbanized areas expand outward. Therefore the tools, such as a regional GIS are required to manage infrastructure inventory on a regional basis.

### **Local Engineering Planning Using Regional Data**

Municipalities have identified the need for regional GIS data to assist in their local engineering planning processes. For example, the development and planning for transportation should consider the current population or industry growth and forecasts near and beyond the municipal boundary. This can also form the basis for cost sharing many projects based on use.

## Summary of Business Needs - Table E

|                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vision components.                                      | Customer focussed, innovative leaders in a variety of aspects, progressive, provide high quality of lifestyle.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Potential Shared Functions supported by a Regional GIS. | Map updates<br>Financial applications<br>Virtual Community - Facility booking, electronic bill payment<br>Recreation facilities<br>Public works services - weed spraying, water, sewer, street sweeping, road maintenance<br>Bylaw enforcement<br>Building permits<br>Economic Development<br>Master / Regional Planning - Transportation and land use<br>Emergency Dispatch<br>Environmental Studies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Attributes of a Regional GIS.                           | <p><b>Physical:</b></p> <ul style="list-style-type: none"> <li>• Layers of common data – land parcels, infrastructure, proposed plan, roads</li> <li>• Central database for master planning</li> <li>• National spatial Data Infrastructure framework (limited data set)</li> <li>• Contain optional regional applications</li> <li>• Internet based</li> <li>• Centralized server</li> <li>• Secure</li> <li>• Real time access to updated information</li> <li>• Serves spatial and attribute data from a spatially enabled database sourced from a number of corporate applications over an intranet internally and over the Internet through a firewall</li> </ul> <p><b>Function:</b></p> <ul style="list-style-type: none"> <li>• A special group does regional analysis and provides service to the public</li> <li>• Query land information such as use, ownership, assessment</li> <li>• Knowledge sharing</li> <li>• Provide regional planning and infrastructure management</li> <li>• Visualize growth areas</li> <li>• Provides 99% of local use for small municipalities</li> <li>• System for economic development to attract and market the region</li> </ul> | <p><b>Conceptual:</b></p> <ul style="list-style-type: none"> <li>• Center of Excellence</li> <li>• Not one single model will work – need a hybrid</li> <li>• Relationships at corporate level and working level</li> <li>• Equitable and fair (no veto power from largest municipality)</li> <li>• Ensure priorities are established, then focus on method for delivery</li> <li>• Policies and programs in place</li> <li>• Organized and professional</li> <li>• Locally beneficial as well as regional.</li> <li>• Would envision that it should involve the following aspects: <ul style="list-style-type: none"> <li>• Operational – a spatial data committee who would address data and graphic representation issues.</li> <li>• Political aspect – To obtain commitment to support the concept.</li> <li>• Technically, suggest the software should be as close to “off the shelf” as possible.</li> <li>• Skilled resources – Strategies to attract and retain or train skilled technical and applications-knowledgeable personnel.</li> </ul> </li> </ul> <p><b>Methods:</b></p> <ul style="list-style-type: none"> <li>• Focus on data and methods, NOT on the technology</li> <li>• Small, realistic incremental achievable objectives for success</li> <li>• Leverage off of internal (local) strengths</li> </ul> |

|                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Constraints/Issues facing a Regional GIS   | <p><b>Local:</b></p> <ul style="list-style-type: none"> <li>• Need to plan open spaces better</li> <li>• Aging infrastructure – need for better inventory and management tools.</li> <li>• Lack of education at political level as to the benefits of GIS</li> <li>• Future planning – environmental impact from growth</li> <li>• Lack of industrial, commercial or developed land.</li> <li>• Landfill – costs, location of future needs</li> <li>• Deteriorating level of service due to decreasing income from assessment value</li> <li>• Lack of technical expertise (internally)</li> <li>• Transportation congestion</li> <li>• Need to improve internal processes and business functions</li> <li>• Lack of standards</li> <li>• More responsibility is being passed down from province to municipality and residences are demanding more service for their tax dollars. current staff levels will not be able to maintain the same standards in the future with resources available.</li> <li>• Fringe area development and transportation issues</li> <li>• Environmental lobby</li> <li>• Lack of stable revenue sources</li> </ul> | <p><b>Regional:</b></p> <ul style="list-style-type: none"> <li>• FOIPP (Freedom of Information Protection and Privacy)</li> <li>• Unknown costs – how do you cost/justify?</li> <li>• Concern that sharing data would be detrimental to community.</li> <li>• Annexation is sensitive, some areas running out of land</li> <li>• Current hardware may need upgrading to meet minimal requirements</li> <li>• Hands on involvement at political level instead of governance role</li> <li>• Cooperation on a regional basis</li> <li>• Regional interest vs. local interest</li> <li>• Urban vs. rural (difference in philosophy of service, needs, infrastructure)</li> <li>• Need to know how data is being used and by whom</li> <li>• Determine how can each stakeholder benefit directly?</li> <li>• Being able to allocate sufficient resources (time and money)</li> <li>• Coordinating input and costs, organization, adoption</li> <li>• Data and information sharing issues</li> <li>• Overcoming a lack of equality in the amounts that may be shared due to different sizes;</li> <li>• Affording and keeping technical resource people to serve small centres.</li> </ul>                                                                                                                                                                                                                     |
| Indications of support for a Regional GIS. | Supportive: 18                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p><b>Comments / Qualifications / Reasons:</b></p> <ul style="list-style-type: none"> <li>• Encourage cooperation, reduce costs, improve customer service</li> <li>• Knowledge transfer, identify trends of growth and anticipate future demands, better quality of life</li> <li>• Improve sharing, reduce redundancy, maximize benefits and resource usage, market potential for attraction of new business</li> <li>• Shared costs</li> <li>• Cooperation is essential</li> <li>• Education needed to enhance your ability to do your job</li> <li>• Do not know enough but agree if the issues can be resolved, should not take away from local decision making.</li> <li>• Small independents cannot afford to buy into technology on their own, availability of regional expertise</li> <li>• Alliance allows for dissemination of data for knowledge and understanding, rationalize land use planning within the region.</li> <li>• Exploit regional advantages, municipal operations don't end at the boundary in a global economy.</li> <li>• Ensures efficient, well planned regional growth</li> <li>• Standardization / organization of land records, regional modeling and analysis, cost sharing of municipal applications, better serve the public</li> <li>• Management is receptive to the idea, sharing is the way of the future. As long as this is not a cloak and dagger.</li> </ul> |
|                                            | Concerned: 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>• Only if its not detrimental</li> <li>• More education is need to answer</li> <li>• Do not see benefit on information provided to date unless it can be proven to be cost effective and provide true measurable efficiencies to the way we operate.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## Summary of Existing Infrastructure<sup>11</sup> - Table F

| Muni              | Network          | Internet Site | Access to Internet | Intranet used | Hardware Architecture | Operating System | IS / IT staff |
|-------------------|------------------|---------------|--------------------|---------------|-----------------------|------------------|---------------|
| Beaumont          | LAN/WAN          | Yes           | High Speed         | No            | Client/Server         | WNT/NTS          | Outsourced    |
| Bon Accord        | LAN              | Yes           | Dial up            | No            | Client/Server         | W95/98           | Outsourced    |
| Calmar            | LAN              | Yes           | Dial up            | No            | Client/Server         | WNT              | Outsourced    |
| Devon             | LAN              | Yes           | Dial up            | No            | Client/Server         | WNTS/W98         | Outsourced    |
| Edmonton          | LAN/WAN          | Yes           | High Speed         | Yes           | Client/Server         | WNT/UNIX         | In-house      |
| Fort Saskatchewan | LAN/WAN          | Yes           | High Speed         | No            | Client/Server         | WNTS/NT          | In-house      |
| Gibbons           | LAN              | Yes           | Dial up            | No            | Client/Server         | WNT              | Outsourced    |
| Leduc             | LAN/Wireless WAN | Yes           | High Speed         | Yes           | Client/Server         | WNT              | In-house      |
| Leduc County      | LAN/Wireless WAN | Yes           | High Speed         | No            | Client/Server         | WNT              | In-house      |
| Legal             | LAN              | Yes           | Dial up            | No            | Client/Server         | W95              | Outsourced    |
| Morinville        | LAN              | Yes           | Dial up            | No            | Client/Server         | W98              | Outsourced    |
| New Sarepta       | LAN              | No            | Dial up            | No            | Client/Server         | W98              | Outsourced    |
| Parkland County   | LAN/Wireless WAN | Yes           | High Speed         | Yes           | Client/Server         | WNT/W95/98       | In-house      |
| Redwater          | LAN              | Yes           | Dial up            | No            | Client/Server         | W95/98           | Outsourced    |
| Spruce Grove      | LAN/Wireless WAN | Yes           | High Speed         | Yes           | Client/Server         | WNT/W95          | In-house      |
| St. Albert        | LAN/WAN          | Yes           | High Speed         | Yes           | Client/Server         | WNTS/NT          | In-house      |
| Stony Plain       | LAN/Wireless WAN | Yes           | High Speed         | No            | Client                | no response      | Outsourced    |
| Strathcona County | LAN/WAN          | Yes           | High Speed         | Plans         | Client/Server         | Windows NT       | In-house      |
| Sturgeon County   | LAN              | Yes           | Dial up            | No            | Client/Server         | WNT              | Outsourced    |
| Thorsby           | LAN              | No            | Dial up            | No            | Client/Server         | W95              | Outsourced    |
| Warburg           | LAN              | No            | Dial up            | No            | Client                | W95              | Outsourced    |

<sup>11</sup> It should be noted that based on one interview for each municipality, the expertise and knowledge of issues limits the exact status of GIS.

## Summary of GIS Systems<sup>12</sup> - Table G

| Muni              | Current GIS Status         | GIS Vendor    | S/W Applications               | Years implemented | Level of Use           | CAD                     |
|-------------------|----------------------------|---------------|--------------------------------|-------------------|------------------------|-------------------------|
| Beaumont          | No GIS (planning)          | NA            | NA                             | NA                | Beginner               | AutoCAD                 |
| Bon Accord        | No GIS                     | NA            | NA                             | NA                | Beginner               | No                      |
| Calmar            | Implementing               | ESRI          | ArcExplorer                    | <1                | Beginner               | No                      |
| Devon             | Utilization                | AutoDesk      | AutoCAD Map 2000               | 10                | Expert                 | AutoCAD                 |
| Edmonton          | Utilization                | Intergraph    | GeoMedia Suite, MapInfo        | >20               | Expert                 | MicroStation            |
| Fort Saskatchewan | Migration / Implementation | ESRI          | ArcView                        | 3                 | Intermediate           | AutoCAD                 |
| Gibbons           | Implementing               | AutoDesk      | AutoCAD Map 2000               | <1                | Beginner               | No                      |
| Leduc             | Utilization                | ESRI          | ArcView                        | 11                | Expert                 | AutoCAD                 |
| Leduc County      | Utilization                | ESRI          | ArcView                        | <1                | Beginner               | AutoCAD                 |
| Legal             | No GIS                     | NA            | NA                             | NA                | Beginner               | No                      |
| Morinville        | No GIS                     | NA            | NA                             | NA                | NA                     | No                      |
| New Sarepta       | No GIS                     | NA            | NA                             | NA                | NA                     | No                      |
| Parkland County   | Utilization                | Bentley       | Microstation                   | <1                | Intermediate           | Microstation            |
| Redwater          | No GIS                     | NA            | NA                             | NA                | NA                     | No                      |
| Spruce Grove      | Utilization                | ESRI/AutoDesk | AutoCAD Map 2000 / ArcExplorer | 8                 | Intermediate           | AutoCAD                 |
| St. Albert        | Migration / Implementation | in transition | To be determined               | 5                 | Intermediate           | AutoCAD                 |
| Stony Plain       | No GIS                     | NA            | NA                             | NA                | NA                     | AutoCAD                 |
| Strathcona County | Utilization                | ESRI          | ArcInfo, ArcView, Map Objects  | 3                 | Intermediate to expert | AutoCAD for Engineering |
| Sturgeon County   | Utilization                | AutoDesk      | AutoCAD Map 2000               | 3                 | Intermediate           | AutoCAD                 |
| Thorsby           | No GIS                     | NA            | NA                             | NA                | NA                     | No                      |
| Warburg           | No GIS                     | NA            | NA                             | NA                | NA                     | No                      |

<sup>12</sup> It should be noted that based on one interview for each municipality, the expertise and knowledge of issues limits the exact status of GIS.

## Summary of Existing GIS and Development Skill Sets<sup>13</sup> - Table H

| Muni              | GIS Admin  | GIS Users (Analysts)     | GIS Viewers (read/query) | S/W Developers/ Programmers |
|-------------------|------------|--------------------------|--------------------------|-----------------------------|
| Beaumont          |            |                          |                          |                             |
| Bon Accord        |            |                          |                          |                             |
| Calmar            | ⇒⇒         | (GIS recently installed) | (GIS recently installed) |                             |
| Devon             | ⇒⇒         | ⇒⇒                       | ⇒⇒                       | Outsourced                  |
| Edmonton          | ⇒⇒         | ⇒⇒                       | ⇒⇒                       | Outsourced                  |
| Fort Saskatchewan | ⇒⇒         | ⇒⇒                       | ⇒⇒                       | Outsourced                  |
| Gibbons           | Outsourced | (GIS recently installed) | (GIS recently installed) |                             |
| Leduc             | X          | ⇒⇒                       | ⇒⇒                       | ⇒⇒                          |
| Leduc County      | Outsourced | ⇒⇒                       | ⇒⇒                       | Outsourced                  |
| Legal             |            |                          |                          |                             |
| Morinville        |            |                          |                          |                             |
| New Sarepta       |            |                          |                          |                             |
| Parkland County   | ⇒⇒         | ⇒⇒                       | ⇒⇒                       | Outsourced                  |
| Redwater          |            |                          |                          |                             |
| Spruce Grove      | ⇒⇒         | ⇒⇒                       | ⇒⇒                       |                             |
| St. Albert        |            | ⇒⇒                       | ⇒⇒                       |                             |
| Stony Plain       |            |                          |                          |                             |
| Strathcona County | ⇒⇒         | ⇒⇒                       | ⇒⇒                       | Outsourced                  |
| Sturgeon County   | ⇒⇒         | ⇒⇒                       | ⇒⇒                       | Outsourced                  |
| Thorsby           |            |                          |                          |                             |
| Warburg           |            |                          |                          |                             |

<sup>13</sup> It should be noted that based on one interview for each municipality, the expertise and knowledge of issues limits the exact status of GIS.

## APPENDIX E – GLOSSARY

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### **Database**

A collection of data elements related by a common fact or purpose.

### **Data Capture**

Series of procedures and operations required to encode data in a computer-readable form.

### **Data Quality**

The degree of accuracy exhibited by data in relation to its representation of an actual object.

### **Geographic Information System (GIS)**

System of computer hardware, software, and procedures designed to support the capture, management, manipulation, analysis, modeling, and display of spatially referenced data for solving complex problems.

### **Layers**

Various overlays of data each dealing with one thematic topic.

### **Metadata**

Data about data. A data dictionary describing the content and structure of a data set.

### **Spatial Data**

Data pertaining to the location of geographical entities together with their spatial dimension.

## APPENDIX F – SURVEY QUESTIONNAIRE

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A condensed version of the survey questionnaire is provided.

### ACRGR Regional GIS Questionnaire

The purpose of this questionnaire is to assess the current situation of GIS and Internet needs, capabilities, IT infrastructure, future direction and constraints within the municipalities located in the Capital Region.

The approach is to interview municipal representatives and use the findings to develop a report identifying the feasibility and benefits of a regional GIS/Intranet that would bring together common information across the region for the purposes of facilitating decision support and regional planning.

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#### CONTENTS

##### Section A – Current Information Technology

This section is best targeted to an IT or MIS Manager position as the questions are technical in nature such as describing the current network and hardware architecture.

##### Section B – GIS Technical

If there are future plans or an existing GIS system is in place, this section is aimed at the GIS Coordinator or Manager to inventory applications and spatial data.

##### Section C – Business Needs

These questions are designed to probe into a high level of current functions, business issues and future direction. Best respondent would be a Chief Administrative Officer or City Manager.

---

Interviewer(s): \_\_\_\_\_

Date: \_\_\_\_\_

Municipality: \_\_\_\_\_

Interviewee: \_\_\_\_\_

Title: \_\_\_\_\_

Interviewee: \_\_\_\_\_

Title: \_\_\_\_\_

Section A – Current Information Technology

|    | Topics                                                                                                                                                                                                    | Response |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
|    | Intranet/Internet Inventory                                                                                                                                                                               |          |
| 1a | Do you have an Internet site? If so, what is the URL?                                                                                                                                                     |          |
| 1b | What is the main purpose for the site? (economic development, events, contacts)<br>Are there plans for expanding its capability?                                                                          |          |
| 1c | Is the site maintained internally or outsourced?                                                                                                                                                          |          |
| 1d | Do you utilize an intranet/extranet?                                                                                                                                                                      |          |
| 1e | What departments contribute information to this site?                                                                                                                                                     |          |
| 1f | Is there any special functionality developed beyond static information?<br>online forms (ie. permits)?<br>electronic billing?<br>virtual town hall concept?<br>Can you describe any plans of this nature? |          |
|    | Inventory of key aspects of the existing technology required to support GIS/Intranet                                                                                                                      |          |
| 2a | What hardware environment/architecture exists? (ie. Client/server, mainframe, standalone PC) running on what operating system?                                                                            |          |
| 2b | Does your town/City Hall have a LAN?<br>Are buildings connected through a WAN?<br>What network protocols are used? (TCP/IP)<br>Bandwidth?<br>Are there any plans to upgrade in the near future?           |          |
| 2c | What data from other departments is shared or integrated with the GIS?                                                                                                                                    |          |
| 2d | What services are shared with other municipalities?<br>What information / data is shared?                                                                                                                 |          |
| 2e | Are there currently external agencies accessing/delivering data for services such as:<br>Financial?<br>Permitting?<br>Inspections?<br>Assessment?<br>Taxation?                                            |          |
| 2f | Is there a strategic IS or IT plan? Does it include GIS? Is it inter-departmental?                                                                                                                        |          |
|    | Established Skill sets                                                                                                                                                                                    |          |
| 3a | What type of resources are employed?<br>GIS admin (doer)<br>GIS analyst (user)<br>GIS viewers<br>programmers<br>DBA, System admin, etc.                                                                   |          |
| 3b | Are IT functions/processes outsourced?<br>H/w, s/w maintenance?<br>System development?                                                                                                                    |          |

Section B – GIS Technical

|    |                                                                                                       |  |
|----|-------------------------------------------------------------------------------------------------------|--|
|    | GIS Inventory                                                                                         |  |
|    | Is the municipality currently using GIS, planning to in the near future or no plans? Is CAD utilized? |  |
| 4a | Who are the software vendors? What software applications are used?                                    |  |
| 4b | How long has the GIS or CAD been in place? How long have they been using the existing system?         |  |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 4c | What is the current level of GIS sophistication? (ie. expert or learning) Are any GIS services or functions outsourced?                                                                                                                                                                                                                                                                                                                                                                                           |  |
| 4d | Can you list some existing interfaces to other external entities for GIS data. (contractors, other municipalities)?                                                                                                                                                                                                                                                                                                                                                                                               |  |
| 4e | Is spatial data stored in a database? (ie. Oracle 8i SC) Any future plans?                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |
| 4f | Is the GIS currently web enabled? (maps on the intranet or Internet)                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |
| 4g | Inventory of data<br>Geographic data<br>What projection is used?<br>What is the predominant format?<br>What is the positional accuracy?<br>Parcel / base mapping updates?<br>Addressing data?<br>Street Network exist? Describe<br>What boundary features exist? (muni, zoning districts, neighborhoods, etc.)<br>Are there any planimetric features? (man-made features from air photos).<br>Air photo?<br>GPS data collected?<br>Demographic data from Statistics Canada or internally collected though census? |  |
| 4h | What are some of the major functions within your municipality that are associated to your GIS system?                                                                                                                                                                                                                                                                                                                                                                                                             |  |
| 4i | Can you provide us with a data model or a list of features with attribution?                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
| 4j | Do you have documented data standards? Can these be provided to us as well?                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |

Section C – Business Needs

|    |                                                                                                                                                                                              |  |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 5  | Future Direction                                                                                                                                                                             |  |
| 5a | What municipal functions do you think could be shared effectively?                                                                                                                           |  |
| 5b | Would you have any concerns or issues around sharing data with other municipalities?                                                                                                         |  |
| 5c | Internally, describe a scenario in which you see your organization in the future. (ie. do they have a vision or mission statement to project 3-5 years)                                      |  |
| 5d | If a common GIS system was commissioned, what would it look like in your view?                                                                                                               |  |
| 6  | Current Issues or Constraints                                                                                                                                                                |  |
| 6a | Are there any business challenges with respect to land management within your municipality or with neighboring municipalities?<br>(such as adequate planning, land use at municipal borders) |  |
| 6b | Are there any concerns with respect to providing an appropriate level of service for all of your constituents? (such as water/waste, education, recreation)                                  |  |
| 6c | What do you think is the most significant issue your municipality faces in relation to the regional GIS?<br>ie. political, organizational, technological, economic.                          |  |
| 6d | What are some other issues that could be a factor towards establishing a regional GIS?                                                                                                       |  |
| 6e | Do you believe in the value of a regional GIS system? (ie. do you support an effort to implement a common delivery model?)<br>Why do you think this is necessary?                            |  |

